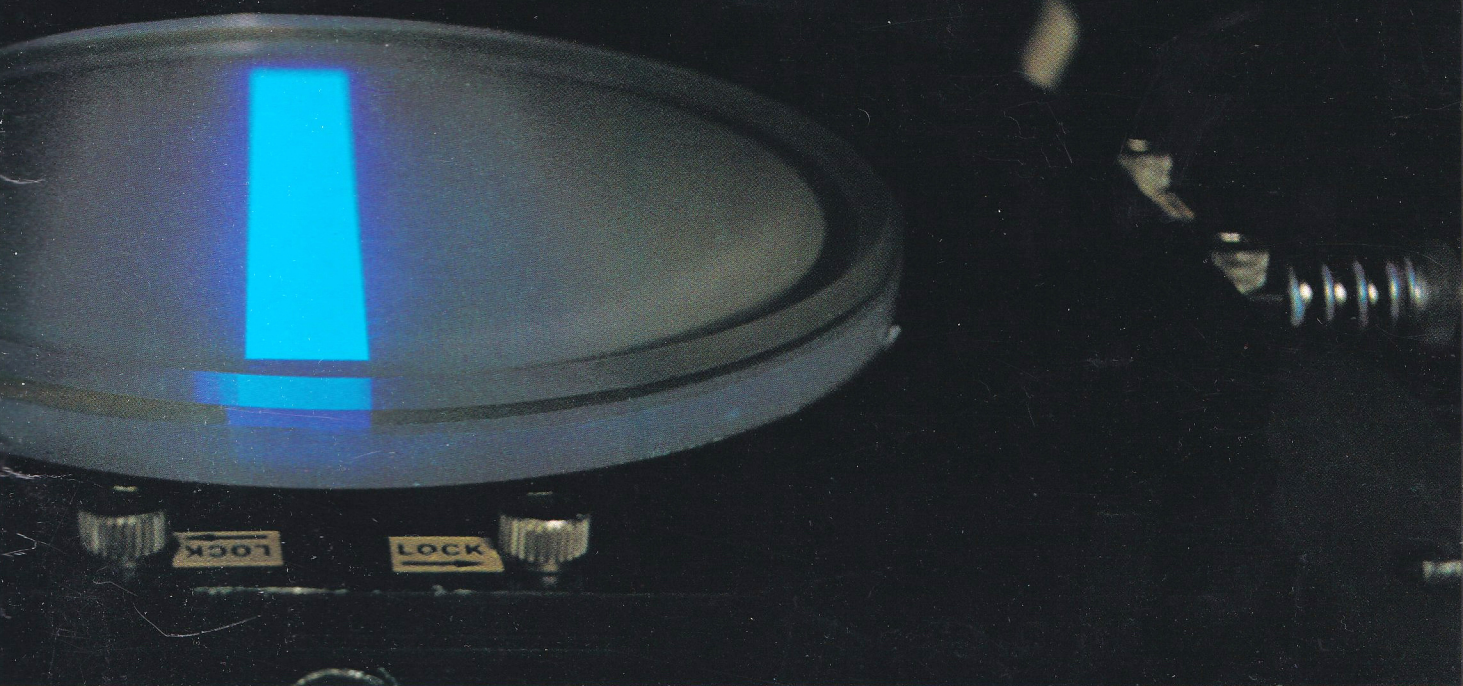


INPUT COMMAND LANGUAGE

for the APS-5 Family of Phototypesetters



**AUTOLOGIC
INCORPORATED**

Autologic
Input Command Language
(ICL)
Reference Manual

Copyright © 1980
by
Autologic, Incorporated
All rights reserved

CONTENTS

Page

SECTION 1.0 GENERAL DESCRIPTION

1.1 INTRODUCTION	1
1.2 OPERATING SYSTEM APPLICATIONS.....	1
1.3 OVERVIEW: JOB STREAM.....	1

SECTION 2.0 DATA FORMATS AND UNITS OF MEASURE

2.1 MODE OF INPUT	2
2.1.1 Programmed I/O	2
2.1.2 DMA Transfer	2
2.2 UNITS OF MEASURE	3
2.3 FONT SIZING AND NUMBERING	3
2.3.1 Font Master Sizes and Scaling	3
2.3.2 Scale Factor	3
2.3.3 Spot Size.....	5
2.3.4 Lens Magnification	5
2.3.5 Font-Numbering Conventions	5

SECTION 3.0 COMMAND PROCESSING

3.1 COMMAND TYPES	6
3.2 ILLEGAL COMMANDS AND ERROR DISPLAYS.....	6
3.3 CLASSIFICATION BY TYPE	6

SECTION 4.0 GENERAL-PURPOSE PHOTOTYPESETTING COMMANDS

4.1 CHANGE FONT AND SIZE COMMANDS.....	7
4.1.1 Change Font (CF).....	7
4.1.2 Change and Lock Font (CL)	7
4.1.3 Unlock a Font (UF)	7
4.1.4 Set Point Size (PZ)	7
4.1.5 Set Vertical Size (VZ)	7
4.1.6 Set Horizontal Size (HZ)	8
4.2 SHIFT COMMANDS.....	8
4.2.1 Shift In (SI)	8
4.2.2 Shift Out (SO)	8
4.2.3 Shift Level (SL)	8
4.3 OBLIQUING COMMANDS	8
4.3.1 Set Oblique Angle (OA)	8
4.3.2 Oblique Mode (OM).....	8
4.3.3 Normal Mode (NM).....	8

CONTENTS (Continued)

	Page
4.4 MARGIN AND TAB COMMANDS	9
4.4.1 Set Left Margin (MA).....	9
4.4.2 Return Beam To Left Margin (RB).....	9
4.4.3 Carriage Return (CR)	9
4.4.4 Set Tab (ST)	9
4.4.5 Tab (TB)	9
4.4.6 Tab Carriage Return (TC)	9
4.5 SPACING COMMANDS.....	9
4.5.1 Vertical Spacing Commands	10
4.5.2 Horizontal Spacing Commands.....	10
4.5.3 Immediate Absolute Horizontal Spacing Commands.....	10
4.5.4 Immediate Relative Horizontal Spacing Commands.....	11
4.5.5 Store/Execute Horizontal Space Commands.....	11
4.5.6 Letterspace Commands.....	11
4.6 POSITIONING COMMANDS	11
4.6.1 Mark Vertical Position (MV).....	11
4.6.2 Return to Vertical Mark (RM)	12
4.6.3 Position Vertical Absolute (PV)	12
4.6.4 Page Lead Immediate Vertical (PL)	12
4.6.5 Mark Horizontal Position (MH)	12
4.6.6 Return to Horizontal Mark (HM).....	12
4.6.7 Position Horizontal Absolute (PH)	12
4.6.8 Mark Location (ML).....	12
4.6.9 Return to Location (RL)	12
4.6.10 Return to V-Location (RV)	12
4.6.11 Return to H-Location (RH)	12
4.7 RULE COMMANDS.....	12
4.7.1 Rule A Commands.....	12
4.7.2 Rule B Commands	13
4.8 SPECIAL EFFECTS COMMANDS	13
4.8.1 Begin Underline Mode (UL)	13
4.8.2 End Underline Mode (UE)	13
4.8.3 Set Retrace (RT)	13
4.8.4 Adjust Intensity (IN).....	14
4.8.5 Repeat Character (RC)	14
4.8.6 Begin Wrong Reading Mode (WR)	14
4.9 RECURSIVE AND SUBROUTINE COMMANDS	14
4.9.1 Reserve String (RS).....	14
4.9.2 Execute String (ES).....	15
4.9.3 Reset String Pointer (RP).....	15
4.9.4 Set String Counter (SC)	15
4.9.5 Decrement Counter (DC).....	15

CONTENTS (Continued)

	Page
4.9.6 Close String (CS).....	15
4.9.7 Matrix in Data Stream (MX).....	15
4.10 OPERATOR INTERFACE COMMANDS.....	16
4.10.1 Start Page (SP).....	16
4.10.2 End of Job (EJ).....	16
4.10.3 Cut Media (CM).....	17
4.10.4 Halt (HT).....	17
4.11 UTILITY COMMANDS.....	18
4.11.1 Reset (RI).....	18
4.11.2 Skip Data (SB).....	18
4.11.3 Display Font (DF).....	18
4.11.4 Display All Fonts (AF).....	18

SECTION 5.0

SPECIAL-PURPOSE COMMANDS

5.1 MICROFILM RECORDING UNIT (MRU) COMMANDS.....	19
5.1.1 Set MRU Zoom Factor (ZF).....	19
5.1.2 Set MRU Margin (MU).....	19
5.1.3 Set MRU Frame Pulldown (PD).....	20
5.1.4 Set MRU Advance Image (MI).....	20
5.2 APS-VIEW MODE.....	20
5.2.1 Set Program Mode (PM).....	20
5.3 GRAPHICS MODE.....	20
5.3.1 Begin Drawing Mode (DW).....	22
5.3.2 Escape Drawing Mode (XD).....	24

APPENDIX A

STANDARD CHARACTERS.....	A-1
--------------------------	-----

APPENDIX B

ALPHABETICAL, NUMERICAL, AND FUNCTIONAL INDEX OF COMMAND CODES.....	B-1
---	-----

APPENDIX C

ON-LINE SPECIFICATIONS.....	C-1
General.....	C-1
Connection to APS-5 On-Line Interface.....	C-2
APS-Micro 5 On-Line Connection.....	C-4

TABLES

2-1	Font Master Size Scaling Limits.....	5
2-2	Font-Numbering Examples.....	5
5-1	Graphics Header (GH) Block Format.....	21
5-2	Line-Art Graphic Data Byte-Pair Format.....	22
5-3	Parameter List (PL) for BEGIN DRAWING MODE.....	23
5-4	Option Flag Word (OFW) Format.....	24
A-1	Standard Characters	A-1
B-1	Alphabetical Command Code Index	B-1
B-2	Numerical Command Code Index.....	B-4
B-3	Functional Command Code Index.....	B-7
C-1	Electrical Interconnections for APS-5	C-3
C-2	Electrical Interconnections for Micro 5	C-6

FIGURES

2-1	Paper Tape Format.....	2
2-2	Unlabeled Magnetic Tape Format.....	4
2-3	IBM Standard Labeled Block Format.....	4
2-4	Individual Block Format	4
2-5	Type 2 Command Format	4
C-1	On-Line Interface Handshaking Diagram.....	C-1
C-2	Data Order Per Page	C-2
C-3	APS-5 On-Line Interface Block Diagram.....	C-2
C-4	On-Line Interface Timing Diagram.....	C-4
C-5	APS-Micro 5 On-Line Interface Block Diagram.....	C-5

1.0 GENERAL DESCRIPTION

1.1 INTRODUCTION. Autologic Input Command Language (ICL) is a symbolic language composed of command codes which control the processing and output of Autologic phototypesetters and specialized graphics equipment.

Phototypesetting commands, for example, establish fonts, margins, and leadings for typeset jobs and specify whether the output is to be typeset or displayed on an APS-VIEW unit. Special-purpose commands apply to specific functions in specialized equipment such as the APS-41 Scanner, the APS-51 Microfilm Recording Unit (MRU), and the APS-52 Microfiche Recording Unit.

The input commands described in this manual apply to all Autologic phototypesetters unless restricted by hardware or software limitations. Those commands which are not available on certain systems are marked with an asterisk (*). Those commands which apply to a specific hardware unit are unavailable to systems without that hardware unit, although the commands still reside within the program.

The operating systems on Autologic phototypesetters are responsible for recognizing the input hardware unit and presenting the binary job data to their respective CPUs and processing modules. The input data that is presented to the system must be formatted as described in this manual for proper recognition of job data.

1.2 OPERATING SYSTEM APPLICATIONS. The input commands described in this manual apply to all

APS-Micro 5s, and to all APS-5s operating under Autologic's Display Control Operating System (DCOS). Users processing ICL commands under DCRT or DCRTU operating systems should consult the previous publication of this manual.

1.3 OVERVIEW: JOB STREAM. The job stream for all Autologic phototypesetters consists of 8-bit bytes of binary data that are character or command codes. Character codes, symbolically represented as 1-128 decimal (1-200 octal, or 1-80 hexadecimal), result in a character matrix call to a font stored on the font disk or in CPU memory. The character matrix, stored in the patented Autologic nibble code format, is then sent to the system's analog display logic and "painted" on the phototypesetter's CRT. The symbolic codes for character graphics are presented in Appendix A.

Command codes, symbolically represented as 129-255 decimal, (201-377 octal, or 81-FF hexadecimal), result in CPU signals which are sent to the various software modules or logic drawers that control beam position on the CRT and media movement in the typesetter transport mechanism. These codes also control output on other media such as MRUs and APS-VIEW display units, as specified by the user.

NOTE

Commands 0 and 255 decimal (377 octal, or FF hexadecimal) are reserved as no-operation (pad-out) codes.

2.0 DATA FORMATS AND UNITS OF MEASURE

2.1 MODE OF INPUT. Input data transfers from peripherals to the CPU occur in two fundamental modes: Programmed I/O (PIO) or Direct Memory Access (DMA). The mode of input is determined by hardware design.

2.1.1 Programmed I/O. Job data is entered one 8-bit byte at a time via an input device data buffer and one of the central processing unit (CPU) registers. PIO may use eight-level punched tape as input medium, entered by way of a high-speed (500 frames/second) paper tape reading device, or transfer may occur a byte at a time through a buffer interfaced with another data processing system (up to 10,000 frames/second).

a. Paper Tape Format.

Paper tape format is eight-level, 1-inch-wide, in-line sprocket feed as shown in Figure 2-1. The first command on the tape is **CHANGE FONT** (octal 0260), followed by a 16-bit (byte-pair) operand (octal 0177630) specifying Font No. -104. The first 8-bit byte is the most significant byte (MSB) and the second is the least significant byte (LSB).

The second command (octal 0263) specifies a type size of 80 points in the 16-bit operand that follows it. The

next four 8-bit bytes are character codes. The last byte (octal 0342) is a command specifying **CARRIAGE RETURN**.

No blocking or start-of-job command is required on paper tape. The typesetter continues to read paper tape and to set type until it encounters an **END OF JOB** command on the tape or until it reaches the end of the tape. The tape end should be cut in a V-shape as shown in Figure 2-1 to prevent its being misread.

b. On-Line Format.

On-line format is the same as the paper tape format described above.

2.1.2 DMA Transfer. Direct Memory Access (DMA) transfers variable-length blocks of data from a magnetic tape controller through the DMA channel. The significance of this mode is that a variable-length block is transferred in main memory at each input request. These blocks must be a minimum of 20 bytes and a maximum of 1024 bytes, in most cases. Drawing mode blocks may be 8192 bytes in length. If the APS-5 system uses a UF(1) controller, blocks must contain an even number of bytes.

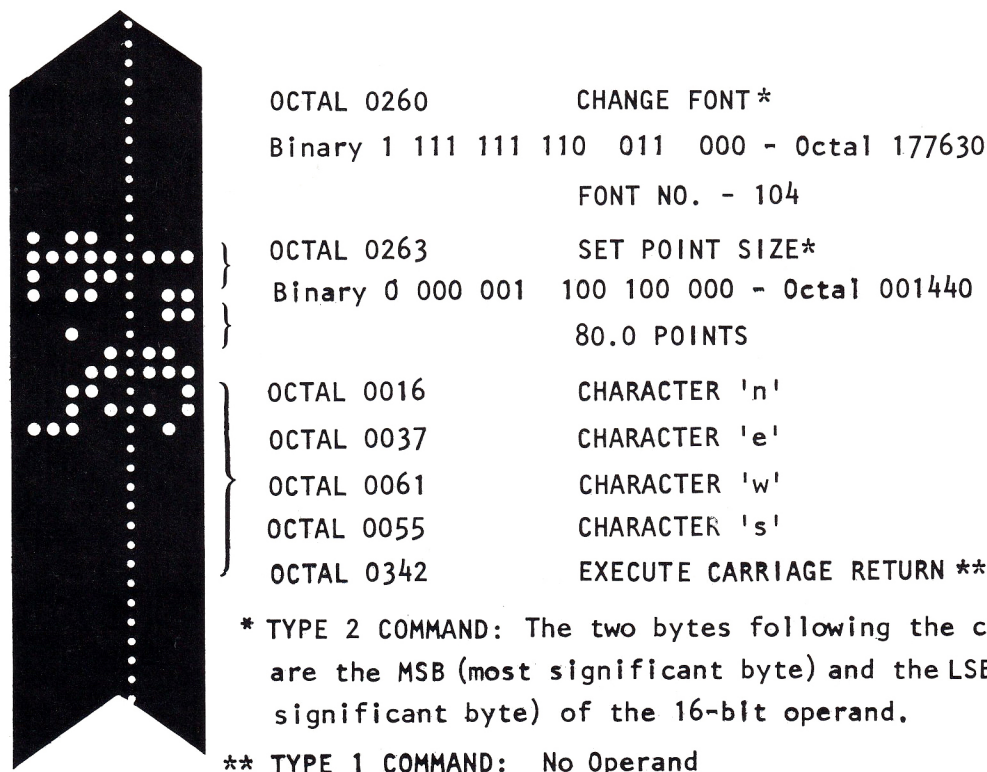


Figure 2-1. Paper Tape Format

a. Magnetic Tape Format.

Magnetic tape format is nine-track, 800 bpi, with 1600 bpi optional. Blocks vary in length from a minimum of 20 bytes to a maximum of 1024 bytes; block lengths must be an even number of bytes. For maximum efficiency, blocks should be the full 1024 bytes without pad-out bytes, because the use of smaller blocks reduces throughput. For example, the use of 128-byte blocks can reduce throughput by as much as 50 percent.

Magnetic tape may be unlabeled or may contain IBM standard labels. Single jobs (takes) may be stacked on a tape. Single file marks may be used to separate takes on the tape; however, the typesetter ignores all single file marks and continues to set type until a double file mark indicating the end of data is encountered. An END OF JOB (EOJ) command on the tape does not stop the typesetting process. The EOJ command has the same effect as a RESET command (returns basic typesetting parameters to their default values), and processing continues until the double file mark is read.

b. Unlabeled Format.

The unlabeled tape format is shown in Figure 2-2. The beginning-of-tape (BOT) marker is followed by a single file mark which is then followed by block No. 1, 2, 3, etc. Jobs are separated by single file marks. The double file mark indicates the end of data on the tape.

c. IBM Standard Labeled Format.

The IBM standard labeled format is shown in Figure 2-3. Following the BOT marker is the volume header block(s) containing header information desired by the user. Volume header blocks are ignored. Processing begins after the first file mark and continues until a double file mark (EOT) is encountered.

d. Individual Block Format.

The individual block format on a magnetic tape is shown in Figure 2-4. The first two bytes of the block contain the binary value of the total number of bytes in the block. The block must have no less than 20 bytes nor more than 1,024 bytes. The third and fourth bytes may contain any information desired by the user. Subsequent bytes are data bytes.

NOTE

Commands with operands falling at the end of one block may cross the block boundary into the next block. An example is shown in Figure 2-5. The example used is SET POINT SIZE (10 points).

2.2 UNITS OF MEASURE. Units of measure are expressed in terms of relative and absolute values. The standard Autologic relative unit is 100 units to the em. Absolute units of measure are expressed in terms of fixed quantities, usually tenths of a point. Absolute units must be used to specify font size and may be used to specify horizontal or vertical spacing. Units of measure used in typesetting are:

10 points = 0.138333 inch

12 points = 1 pica

1 pica = 0.1660 inch = 4.216mm

1 inch = 72.29 points = 6.024 picas

1 em = 100 relative units

1 spot = 1 stroke

For Range 1: 1 em = 100 strokes

2: 1 em = 200 strokes

3: 1 em = 400 strokes

4: 1 em = 800 strokes

2.3 FONT SIZING AND NUMBERING. All Autologic typesetters are designed for sizing and setting type from an array of font master sizes. The system recognizes only master sizes or sizes scaled down or up from the master sizes within certain limits.

2.3.1 Font Master Sizes and Scaling. The font master sizes in a particular user's system are dependent on three parameters:

- The magnification factor of the lens in the user's hardware.
- The master sizes ordered for the user's font library.
- The typesetter model (e.g., APS-5A, APS-5C, APS-Micro 5, etc.).

Each master size has a corresponding range of limits from which the master size may be scaled down or up. Scaling limits corresponding to lens magnification factors, master sizes, and ranges are shown in Table 2-1.

2.3.2 Scale Factor. Scale factor (SF) is the ratio of typeset character size to master size. (Refer to Table 2-1.) The default value is one. Both the vertical and horizontal scale factors may be changed by the SET POINT SIZE and SET MRU ZOOM FACTOR commands. They are the product of the effect of these commands.

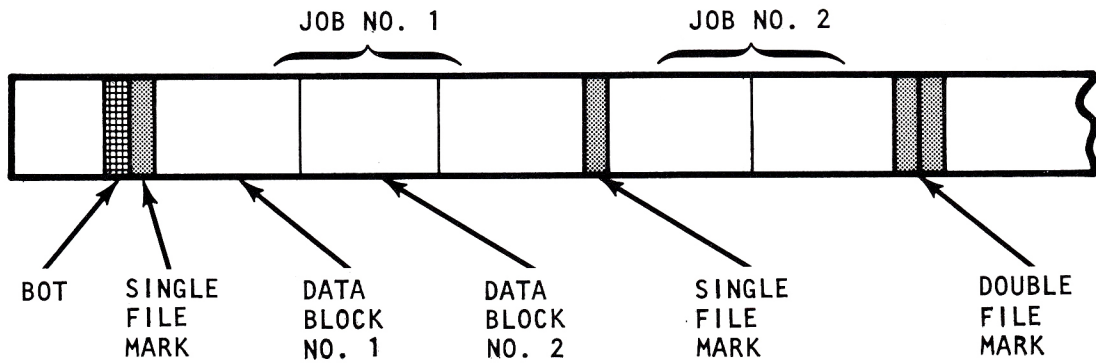


Figure 2-2. Unlabeled Magnetic Tape Format

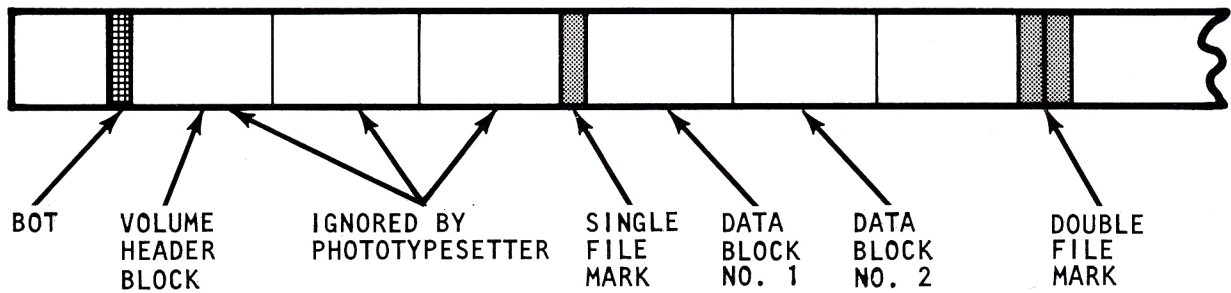


Figure 2-3. IBM Standard Labeled Block Format

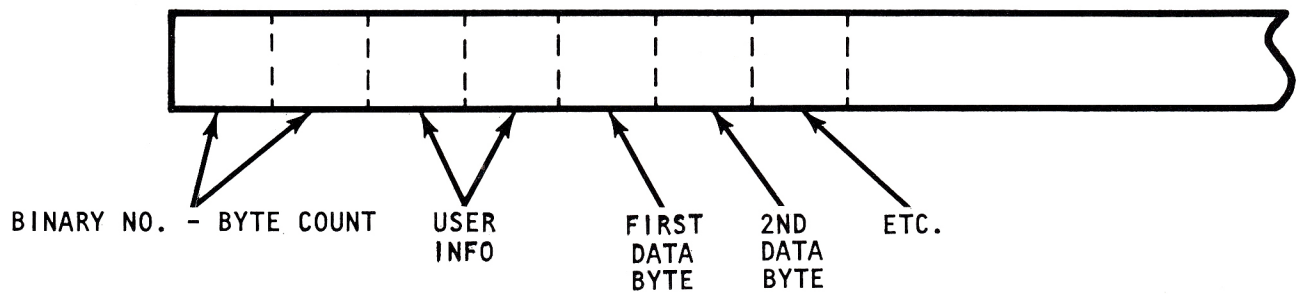


Figure 2-4. Individual Block Format

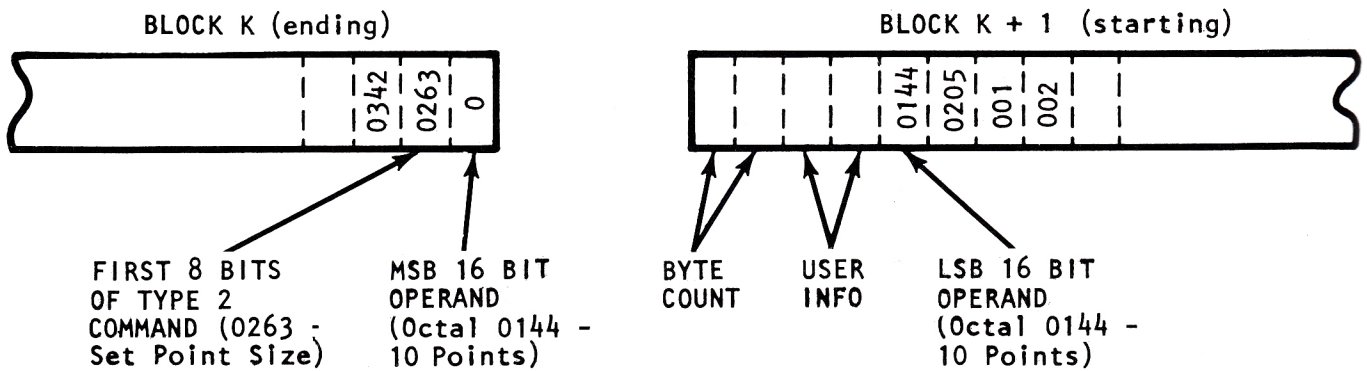


Figure 2-5. Type 2 Command Format

Table 2-1. Font Master Size Scaling Limits

Lens Magnification	Master Size (points)	Range	Size Limit (points) APS-5C	Size Limit (points) Other
2.222X (exactly 20/9) Used with 57- and 100-pica typesetters	Special	0	---	---
	10	1	5.0 - 10.0	5.0 - 12.5
	20	2	5.0 - 20.0	10.0 - 25.0
	40	3	10.0 - 40.0	20.0 - 50.0
	80	4	20.0 - 80.0	40.0 - 80.0
	160	5	40.0 - 160	80.0 - 160.0
		6	80.0 - 320	
2.667X (exactly 8/3) Used with 70- pica typesetter	Special	0	---	---
	12	1	6.0 - 12.0	6.0 - 15.0
	24	2	6.0 - 24.0	12.0 - 30.0
	48	3	12.0 - 48.0	24.0 - 60.0
	96	4	24.0 - 96.0	48.0 - 96.0
	192	5	48.0 - 192	96.0 - 192
		6	96.0 - 384	

2.3.3 Spot Size. Spot size is given by the relation:

$$1 \text{ spot} = 0.0013833 \times \text{SF inch}$$

where SF = ratio of a character's typeset size to its master size.

2.3.4 Lens Magnification. Lens magnification (LM) is the ratio of image size on the medium to image size on the tube face. The values are also given in Table 2-1.

2.3.5 Font-Numbering Conventions. The rules for numbering fonts are as follows:

- The default font is numbered 0000 (Permafont) and is required in all user's libraries.
- Fonts may have any user-designated number from 1 to 32,755 decimal.
- The font-numbering system consists of up to five decimal digits. The first four digits normally specify the font style number; the last digit specifies the range.

Examples of font-numbering are given in Table 2-2.

The data structures described in this section apply to

all Autologic phototypesetters. Individual commands that describe how the data is to be processed are defined in the next section.

Table 2-2. Font-Numbering Examples.

Font Style Number (Decimal)	Font Range	Font Number Used in Program (Decimal)
1	1	00011
1	2	00012
1	3	00013
1	4	00014
1	5	00015
1	6	00016
2	1	00021
2	2	00022
2	3	00023
2	4	00024
2	5	00025
2	6	00026

3.0 COMMAND PROCESSING

3.1 COMMAND TYPES. Command codes are represented in the input stream as 8-bit bytes in the range 129 through 255 decimal (0201 thru 0377 octal, 81 thru FF hexadecimal). Not all of the possible codes have been assigned functions. Those that are unassigned have been reserved for future use. Command codes are of three types:

Type	Description
Type 1:	These 8-bit bytes have no operands.
Type 2:	These 8-bit bytes are always followed by operand of one byte-pair which may contain any binary value.
Type 3:	These 8-bit bytes are followed by one or more operand byte-pairs.

NOTE

When the value of an operand byte-pair is a negative number, two's complement notation is used. The first byte is the more significant. An undefined command value results in an undefined action, and usually a halt with an illegal-command error message display.

CAUTION

Two 8-bit codes are reserved for no-operation or pad-out bytes. These two values are 0 and 255 decimal (0377 octal or FF hexadecimal). Because they represent valid numerical values for type 2 or 3 command operands, they must not be used to separate a command from its operand.

3.2 ILLEGAL COMMANDS AND ERROR DISPLAYS. When an illegal command or command value is discovered by the phototypesetter, an error display occurs. In the APS-5, the error display occurs on the APS-5 Operator's panel. In the APS- μ 5, a message may or may not appear on the alphanumeric display, depending upon the settings of the machine's Program Option Switches (POSs). Each ICL command affected by an APS- μ 5 POS is discussed in the INDIVIDUAL COMMANDS section of this document.

3.3 CLASSIFICATION BY TYPE. Individual ICL commands are grouped by function in sections 4.0 and 5.0. For ease of reference, the commands are listed in alphabetical and numerical order in Appendix B. In the descriptions that follow, the numerical values of each command code are above the text: octal on the left, decimal in the center, and hexadecimal on the right.

Type 2 and Type 3 commands are followed by any default value that the command may have, if any. The user should be aware of any default values that a type 2 or 3 command may have.

The two-letter mnemonic assigned to each command is given in parentheses after the command title. Mnemonics are abbreviated command names used in a command dump (see Appendix B). The mnemonics may be correlated with the command titles printed out in the command dump and with the definitions given in this manual.

All negative operand values are given in two's-complement form.

NOTE

Commands marked with an asterisk (*) do not apply to APS-Micro 5 systems, usually because they are used in other Autologic hardware systems (e.g., APS-41 Scanner).

4.0 GENERAL-PURPOSE PHOTOTYPESETTING COMMANDS

4.1 CHANGE FONT AND SIZE COMMANDS. A CHANGE FONT command must be followed by set size command(s); otherwise, the typesetter will set the new font at unity scale (master size).

Error reporting is handled differently in the APS-5 and the APS- μ 5 for illegal font calls and illegal scaling connected with the font calls. The differences are as follows:

APS-5: If a font cannot be found in the system font directory, the typesetter halts and ILLEGAL FONT is displayed on the Operator's Control Panel. To continue, the operator must reinitialize the typesetter.

APS- μ 5: If a font cannot be found in the system font directory, the typesetter performs the following error reporting, depending upon the setting of Program Option Switch (POS) 4:

- 0 (Default) = Stop processing and display ILLEGAL FONT. If the operator presses PROCEED, the typesetter uses Permafont (number 0000) and continues typesetting.
- 1 = Stop typesetting and display ILLEGAL FONT. If PROCEED is pressed, the machine leads 72 points, searches for the next START PAGE command, and resumes typesetting.
- 2 = Lead 36 points and typeset ILLEGAL FONT CALL in Permafont, beginning at the left margin; leads 36 points and resumes typesetting in the current font.

If an illegal scale is requested in the required SET SIZE command, the APS-5 and the APS- μ 5 will:

APS-5: If a size outside the scaling limits is specified, the typesetter stops and ILLEGAL SCALE is displayed on the Operator's Control Panel. To continue, the operator must reinitialize the typesetter.

APS- μ 5: If a size outside of scaling limits is detected, the typesetter performs the following error reporting, depending upon the setting of Program Option Switch (POS 5). The settings for POS 5 are as follows:

- 0 (Default) = Stop processing and display ILLEGAL SCALE. If the operator presses PROCEED, the typesetter sets scale at unity and continues typesetting.
- 1 = Stop typesetting and display ILLEGAL SCALE. If PROCEED is pressed, the machine leads

72 points, searches for the next START PAGE command, and resumes typesetting.

- 2 = Lead 36 points, set scale at unity, typeset ILLEGAL SCALE at left margin, lead 36 points, and resume typesetting.

4.1.1 CHANGE FONT (CF)

0260 176 B0

Default Font: 0000

This command, followed by a two-byte operand, specifies the new font from which character graphics are to be selected for setting the subsequent input.

4.1.2 CHANGE AND LOCK FONT (CL)*

0255 173 AD

Default: None

This command is exactly like the CF command except that it also locks the selected font into main memory. Locked fonts, however, can be released and rolled out if the CPU needs memory to complete an operation (e.g., to bring in a Range 4 font). Under certain circumstances, this feature can serve to speed the processing of a take. (Experimentation or consultation may reveal the conditions where this command is helpful.)

4.1.3 UNLOCK A FONT (UF)*

0256 174 AE

Default: None

The two-byte operand specifies the font to be unlocked.

4.1.4 SET POINT SIZE (PZ)

0263 179 B3

Default Value: Master Size

The two-byte operand of this command specifies both the horizontal and vertical type sizes in tenths of a point, and thereby determines the horizontal and vertical scale factors. (Refer to Table 2-1 for permissible size limits.) See the CHANGE FONT command for error handling of illegal scaling.

4.1.5 SET VERTICAL SIZE (VZ)

0262 178 B2

Default Value: Master Size

The two-byte operand of this command specifies the vertical type size in tenths of a point, and thereby determines the vertical scale factor.

4.1.6 SET HORIZONTAL SIZE (HZ)

0261 177 B1

Default Value: Master Size

The two-byte operand in this command specifies the horizontal type size in tenths of a point, and thereby determines the horizontal scale factor.

4.2 SHIFT COMMANDS. The shift commands described in this section allow a shift from one level of character or command access to another. The effect of additional levels is expansion of both the character and the command sets.

NOTE

All commands are currently level zero commands (see SHIFT IN (SI) and SHIFT OUT (SO) below for further information). Subsequent releases of Autologic ICL may include commands that function at more than one level.

4.2.1 SHIFT IN (SI)

0365 245 F5

Default: Level Zero

There are two levels of commands available: level zero and level one. At level zero, an SI causes a shift to level one for the next command in the input stream. After the level-one command is processed, access shifts back to level zero unless the command is another SI. If command is an SI at level one, it causes a lock on level-one access and level-one access then remains in effect until an SO is encountered. SI has no effect upon character codes.

4.2.2 SHIFT OUT (SO)

0364 244 F4

Default: None

SHIFT OUT unlocks level-one command access, i.e., restores the typesetter to level-zero command access. SO has no function at level zero and is ignored if encountered in the data stream at level zero. SO has no effect upon character codes.

4.2.3 SHIFT LEVEL (SL)

0224 148 94

Default Level: Zero

SHIFT LEVEL is a type 2 command which includes a two-byte operand: the least significant byte specifies the new level of character access and the most significant byte indicates whether the new level is to be locked (least significant bit = 1) or is to be for one character only (least significant bit = 0). When "next character only" is specified, the current level of access is restored after the single character (new level) is encountered.

There are 16 levels of character access: zero thru 15. This provides for fonts to contain up to 2048 total characters. Characters 1 thru 128 are level zero, 129 thru 256 are level one, etc.

NOTE

SL does not affect command-level access (see SI and SO above). SL has the same function at command levels zero and one.

4.3 OBLIQUING COMMANDS. The following commands may be used to typeset characters at oblique angles.

4.3.1 SET OBLIQUE ANGLE (OA)

0242 162 A2

Default Angle Slope: Positive

The two-byte operand of this command specifies whether the slope of the oblique angle is positive or negative.

APS-5: Any positive operand value specifies a positive oblique angle of 14 degrees; any negative operand value specifies a negative (reverse) oblique of 14 degrees.

APS-μ5: Any positive operand value specifies a positive oblique angle of 12 degrees; any negative operand value specifies a negative (reverse) oblique of 12 degrees.

4.3.2 OBLIQUE MODE (OM)

0351 233 E9

This type 1 command sets subsequent type at a positive or negative oblique angle (as specified by the SET OBLIQUE ANGLE command).

4.3.3 NORMAL MODE (NM)

0350 232 E8

This type 1 command cancels the oblique mode and returns typesetting to normal. The normal mode is automatically set whenever the START PAGE command is executed or the typesetter is reinitialized.

4.4 MARGIN AND TAB COMMANDS.

4.4.1 SET LEFT MARGIN (MA)

0244 164 A4

Default Value: 00000

The two-byte operand specifies, in tenths of a point, the amount by which all copy is to be indented from the normal left margin. Thus, a SET LEFT MARGIN command followed by a value of 240 (decimal) indents all copy 24 points (2 picas) from the normal left-hand margin. Once set, this position becomes the new left margin. The CARRIAGE RETURN and RETURN BEAM TO LEFT MARGIN commands both return the beam to this new margin; the tab value is also measured from it. In other words, all copy is moved two picas to the right on the medium, making the maximum permissible line length 2 picas shorter than before.

The left margin may be reset as many times as desired in the course of a job. Whenever the SET LEFT MARGIN command is encountered, the beam is moved to the position specified, and that position immediately becomes the new left margin.

All margin positions must be specified in terms of a positive distance from the default value of 00000. Thus, a value of 240 (decimal) indents all copy 24 points from the normal left-hand margin; a new set margin command with a value of 360 (decimal) moves the copy 12 more points to the right, or 3 picas from the normal left margin. A SET LEFT MARGIN command with a value of 00000 sets the margin back to the extreme left side of the medium.

The user must take care not to overset the physical limits of the typesetter, as this causes the overset characters to wrap around and pile up at the left margin of the medium. Negative values are not allowed; they also may cause characters to pile up at the left margin of the medium.

4.4.2 RETURN BEAM TO LEFT MARGIN (RB)

0341 225 E1

This type 1 command returns the beam to the left margin, but does not advance the film or paper for the next line.

4.4.3 CARRIAGE RETURN (CR)

0342 226 E2

This type 1 command combines the functions of the RETURN BEAM TO LEFT MARGIN and the EXECUTE STORED VERTICAL SPACE commands. It returns the beam to the left margin and executes the last stored vertical space.

4.4.4 SET TAB (ST)

0323 211 D3

This command is followed by two bytes giving the position of the tab stop (as measured from the current left margin) in tenths of a point. The tab is reset to zero and all parameters are set to default when the typesetter is initialized. This command does not cause any movement of the beam from its current position.

4.4.5 TAB (TB)

0343 227 E3

This type 1 command moves the beam to the tab stop from wherever it happens to be. Only one tab stop is provided. Any number of columns may be set by resetting the tab value, then tabbing to the new tab stop.

4.4.6 TAB CARRIAGE RETURN (TC)

0344 228 E4

This type 1 command combines the functions of the tab with the EXECUTE STORED VERTICAL SPACE command. It moves the beam to the tab stop and executes the vertical spacing stored by the last STORE VERTICAL SPACE command. Multicolumn work may be set by placing the tab at the left margin of a column and using the TAB CARRIAGE RETURN command at the end of each line.

After a column has been completed, reverse leading is used to back up to the top of the next column and the tab can then be reset to the left margin of the new column. The SET LEFT MARGIN command may be used in a similar fashion to set up multicolumn work.

4.5 SPACING COMMANDS. Spacing may be done either horizontally (across the page) or vertically (by vertical beam displacement or by medium movement). It may be in either relative units (1/100 em) or absolute units (1/10 point). Spacing command operand values are not stored unless the typesetter is specifically requested to do so with a STORE HORIZONTAL or STORE VERTICAL spacing command. They must be executed with a EXECUTE HORIZONTAL or EXECUTE VERTICAL spacing command.

All spacing values are signed numbers. Negative horizontal spacing means moving the beam from right to left. Negative vertical spacing means moving the beam upward on a page of copy.

Spacing is executed at any point in the text where the space code is encountered. In particular, it is possible to displace the baseline up (or down) in the middle of a line by using VERTICAL SPACE ABSOLUTE or VERTICAL SPACE RELATIVE commands at any character position in that line.

4.5.1 Vertical Spacing Commands.

(1) VERTICAL SPACE ABSOLUTE (VA)

0300 192 C0

The two-byte operand specifies in tenths of a point the amount of vertical space (up or down) to be executed immediately at the current horizontal position. The maximum vertical space that may be executed with a single command is 3276.7 points for either positive or negative spacing.

(2) VERTICAL SPACE RELATIVE (VR)

0301 193 C1

The two-byte operand specifies the positive or negative value (in relative units) of the vertical distance to be spaced. This command is particularly useful in creating inferior or superior characters and raising or lowering the baseline.

Since in this command spacing is expressed in terms of relative units, it is always proportional to the vertical size of the type being set immediately before the command was given. To set a superior character using this command, a negative vertical space of, say, 33 relative units should first be executed; then a smaller point size, say, 66 percent of the original size, should be selected. After setting the superior character at that size, the original size is resumed, and a positive vertical space of 33 relative units is executed to return to the original baseline.

(3) VERTICAL SPACE IN SPOTS (SD)

0276 190 BE

This command moves the baseline down (positive) or up (negative) by the value given times 0.0013833 (inch).

(4) VERTICAL SPACE IN SCALED SPOTS (VS)

0275 189 BD

This command is identical to the SD command, except that the distance moved is multiplied by the vertical scale factor. (Scaled spots are chiefly useful in Graphic Mode. See section 5.3, GRAPHIC MODE.)

(5) STORE VERTICAL SPACE (V#)

0320 208 D0

Default Value: 0000

The two-byte operand in this command gives the value in tenths of a point of vertical space to be stored. The stored value will be used by the EXECUTE STORED VERTICAL SPACE command.

(6) STORE VERTICAL SPOTS (SR)

0321 209 D1

This command is followed by two bytes giving the value in spots of the vertical space to be stored. The stored value will be used by the EXECUTE STORED VERTICAL SPACE command. The amount moved vertically up the page (negative value) or down the page (positive value) is equal to the value given times 0.0013833 (inch).

(7) EXECUTE STORED VERTICAL SPACE (XS)

0340 224 E0

This command executes the value of vertical space stored by the STORE VERTICAL SPACE or STORE VERTICAL SPOTS command (whichever was last given).

4.5.2 Horizontal Spacing Commands. The maximum space that can be achieved by a 57-pica typesetter is 684.0 points, by a 70-pica 840.0 points, and by a 100-pica 1200.0 points. The typesetter does not check the validity of a horizontal spacing command. If copy is set off the face of the tube, the beam position is undefined. When this happens, all overset characters wrap around and pile up at the left margin. Subsequent lines begin at their proper margin value.

See para. 4.5 for the rules that apply also to the use of horizontal spacing commands.

(1) HORIZONTAL SPACE ABSOLUTE (HA)

0302 194 C2

The two-byte operand specifies in tenths of a point the positive (right) or negative (left) value of the space to be executed.

(2) HORIZONTAL SPACE RELATIVE (HR)

0303 195 C3

The two-byte operand of this command specifies in relative units the positive (right) or negative (left) value of the space to be executed.

(3) HORIZONTAL SPACE IN SCALED SPOTS (HS)

0277 191 BF

This command immediately moves the beam right (positive value) or left (negative value) by the value given times 0.0013833 times horizontal scale factor (in inches).

4.5.3 Immediate Absolute Horizontal Spacing Commands. The following are type 1 absolute horizontal spacing commands. These commands cause

the beam immediately to move to the right the number of points specified in the command.

- (1) HORIZONTAL SPACE 4.5 POINTS (FH)
0212 138 8A
- (2) HORIZONTAL SPACE 9 POINTS (NE)
0211 137 89
- (3) HORIZONTAL SPACE 18 POINTS (EH)
0210 136 88
- (4) HORIZONTAL SPACE 36 POINTS (TS)
0207 135 87
- (5) HORIZONTAL SPACE 72 POINTS (SV)
0206 134 86

4.5.4 Immediate Relative Horizontal Spacing

Commands. The following are type 1 relative horizontal spacing commands. When these commands are given, the beam moves immediately to the right the number of relative units specified.

- (1) HORIZONTAL SPACE 25 UNITS (HI)
0201 129 81
- (2) HORIZONTAL SPACE 50 UNITS (HX)
0205 133 85
- (3) HORIZONTAL SPACE 100 UNITS (HE)
0204 132 84
- (4) HORIZONTAL SPACE 200 UNITS (HQ)
0203 131 83
- (5) HORIZONTAL SPACE 400 UNITS (HH)
0202 130 82

4.5.5 Store/Execute Horizontal Space Commands.

The following are store and execute horizontal space commands. The two-byte operand of the store commands specifies the horizontal space in relative units to be stored. The execute commands (type 1 commands) carry out the spacing stored by the store space commands. Once a value has been stored, it may be executed repeatedly. The value is altered when a new value is stored by the same command or when the typesetter is reinitialized. The stored values are then reset to zero.

- (1) STORE HORIZONTAL SPACE A (A#)
0332 218 DA
- (2) EXECUTE HORIZONTAL SPACE A (#A)

- 0352 234 EA
- (3) STORE HORIZONTAL SPACE B (B#)
- 0333 219 DB
- (4) EXECUTE HORIZONTAL SPACE B (#B)
- 0353 235 EB
- (5) STORE HORIZONTAL SPACE C (C#)
- 0334 220 DC
- (6) EXECUTE HORIZONTAL SPACE C (#C)
- 0354 236 EC
- (7) STORE HORIZONTAL SPACE D (D#)
- 0335 221 DD
- (8) EXECUTE HORIZONTAL SPACE D (#D)
- 0355 237 ED

4.5.6 Letterspace Commands. The following are letter-space commands, which, followed by a two-byte operand, give the amount to be added to (positive number) or subtracted from (negative number) the left side bearing of every character until further notice. Letter-spacing may be altered as frequently as desired or left in force for an entire job. Letterspacing may be cancelled at any time by issuing a letterspace command with a value of zero. The commands may be used as an aid in justification or simply to achieve tighter (or looser) character fit for esthetic purposes. Letterspace value is set to zero when the typesetter is initialized. Of the two letterspace commands, LETTERSPACE RELATIVE is more efficient and is therefore preferred.

- (1) LETTERSPACE ABSOLUTE (LA)
0304 196 C4

This command provides letterspacing in absolute units of tenths of a point.

- (2) LETTERSPACE RELATIVE (LR)
0305 197 C5

Default Value: 0000

This command provides letterspacing in relative units.

4.6 POSITIONING COMMANDS. The following commands allow the beam or media to be moved from its current position.

4.6.1 MARK VERTICAL POSITION (MV)

- 0362 242 F2

This type 1 command stores the vertical position of the beam for future reference. It is essentially a vertical tab set.

4.6.2 RETURN TO VERTICAL MARK (RM)

0363 243 F3

This command moves the beam to the position set by the MARK VERTICAL POSITION command. Horizontal positioning is not affected.

4.6.3 POSITION VERTICAL ABSOLUTE (PV)

0316 206 CE

The value given is a distance in tenths of a point. The beam is moved down (positive) or up (negative) this distance from the position stored by the MARK VERTICAL POSITION command.

4.6.4 PAGE LEAD IMMEDIATE VERTICAL (PL)

0313 203 CB

The two-byte operand specifies, in tenths of a point, the amount of vertical space up (negative) or down (positive) to be executed immediately from the current horizontal position. The maximum vertical space that may be executed with a single command is 3,276.7 points. The value in the operand is not stored. The command executes in the same manner as VERTICAL SPACE ABSOLUTE. Its purpose is to provide the MRU with a page-leading command which is not sensed by the typesetter during operation of the MRU. This allows users to drive both the typesetter and the MRU with the same input (though not simultaneously).

4.6.5 MARK HORIZONTAL POSITION (MH)

0336 222 DE

This command stores the horizontal position of the beam for future reference.

4.6.6 RETURN TO HORIZONTAL MARK (HM)

0337 223 DF

This command moves the beam to the position set by the MARK HORIZONTAL POSITION command. Vertical positioning is not affected.

4.6.7 POSITION HORIZONTAL ABSOLUTE (PH)

0315 205 CD

The value given is a distance in tenths of a point. The beam is positioned right (positive) or left (negative) this distance from the default left margin.

4.6.8 MARK LOCATION (ML)

0217 143 8F

The two-byte operand of this type 2 command is a binary number 0 through 31 which specifies an index for storing the current location. Up to 32 locations may be stored for future reference at any one time. The MARK LOCATION command stores the current x-y location relative to a page boundary (i.e., the beginning of a page is location 0,0), as set by the START PAGE or RESET commands. Maximum distance is ± 3276.7 points. Overflow/underflow is not detected.

4.6.9 RETURN TO LOCATION (RL)

0220 144 90

In this command, the two-byte operand is a binary number 0 through 31 which specifies an index for retrieving the saved location. The beam is moved to this location. The saved location must have been stored by the MARK LOCATION command (ML).

4.6.10 RETURN TO V-LOCATION (RV)

0223 147 93

This command is the same as RETURN TO LOCATION, except that only the vertical position is affected.

4.6.11 RETURN TO H-LOCATION (RH)

0222 146 92

This command is the same as RETURN TO LOCATION, except that only the horizontal position is affected.

4.7 RULE COMMANDS. The store commands for rules allow the user to specify the height and width of either of two rules. The execute commands cause the rules to be drawn. A rule may be visualized as a solid black rectangle of varying dimensions. It may have any height from 1/10 point to 20 points with a 2.222X lens, or 24 points with a 2.667X lens, and any width from 1/10 point to the full width of the medium. Conceived in this fashion, a vertical rule is simply a rectangle with very little width and a fair amount of height; a horizontal rule is a rectangle with very little height and a great deal of width. Rule dimensions are specified in tenths of a point. All rules sit on the baseline. They are drawn from the current position of the beam upward from the baseline. After drawing a rule, the beam rests on the baseline at the right end of the rule.

4.7.1 Rule A Commands.

(1) STORE VERTICAL OF RULE A (AV)

0325 213 D5

This command followed by a two-byte operand sets the value of the height of Rule A in tenths of a point. The maximum permitted value is 200 x 1/10 point, or 20 points with a 2.222X lens and 240 x 1/10 point, or 24 points, with a 2.667X lens. This command is also used to set the height of the underline rule in the BEGIN UNDERLINE MODE command.

(2) STORE HORIZONTAL OF RULE A (AH)

0326 214 D6

This command followed by a two-byte operand sets the value of the horizontal of Rule A in tenths of a point. The minimum permitted value is 1/10 point. The maximum value is as described for the command HORIZONTAL SPACE ABSOLUTE.

(3) EXECUTE RULE A (XA)

0345 229 E5

This command causes drawing of a rule of the dimensions specified by the most recent STORE HORIZONTAL OF RULE A and STORE VERTICAL OF RULE A commands. The typesetter begins drawing the rule wherever the beam happens to be at the time the command is encountered. The beam rests at the lower right corner of the rule after drawing it. The rule rests on the baseline.

(4) EXECUTE RULE A TO TAB (LT)

0346 230 E6

This command causes a rule of the height specified by the most recent STORE VERTICAL OF RULE A command to be drawn from the present position of the beam to the tab location. This can be useful when filling out a field of unknown length with a horizontal rule. This command presumes that the tab is positioned at the right of the current position of the beam.

4.7.2 Rule B Commands. The following commands are used to draw Rule B. These commands operate in the same manner as those described in the Rule A Commands section. There is no Execute Rule B to Tab command.

(1) STORE VERTICAL OF RULE B (BV)

0327 215 D7

(2) STORE HORIZONTAL OF RULE B (BH)

0330 216 D8

(3) EXECUTE RULE B (XB)

0347 231 E7

4.8 SPECIAL EFFECTS COMMANDS. The following commands may be used to attain special effects such as underlining and lighter or darker characters.

4.8.1 BEGIN UNDERLINE MODE (UL)

0247 167 A7

This type 2 command specifies underlining of all text from this point. The thickness of the underline must have been set with a prior STORE VERTICAL OF RULE A command. The two-byte operand specifies in tenths of a point the offset (positive or negative) of the base of the underline from the baseline of the text. The text baseline is the current vertical position when a RETURN BEAM, CARRIAGE RETURN, or END UNDERLINE MODE command is encountered. A negative offset results in a strike-through operation. The underline is drawn from the point in text where the command is given to the point where an END UNDERLINE MODE command is given.

4.8.2 END UNDERLINE MODE (UE)

0367 247 F7

This type 1 command terminates the underline mode. Underlining continues to the point where this command is given and then stops.

4.8.3 SET RETRACE (RT)

0245 165 A5

Default Value: 1

SET RETRACE is employed in the APS-5 to expose a film (such as lith film) with a lower sensitivity than phototypesetting film or to produce a bolder version of some light typefaces where special emphasis is required. In the APS-μ5 it is used to call reverse video mode as well as to set retrace.

APS-5: In the two-byte operand of this command, the low-order 3 bits of the second byte specifies the number of times each stroke of each subsequent character is traced. The default number is 1. A value of 0 (bits 000) causes each stroke to be traced eight times (the maximum possible). If a retrace value higher than 1 is specified, all subsequent copy is retraced the specified number of times until the retrace value is changed.

This is not a recommended procedure when the typeface is being scaled down from the master size.

APS-μ5: Reverse Video is called through the most significant byte of the two-byte operand associated with this command. For support of reverse video, the most significant byte is interpreted as:

- 0 = No video mode change
- 1 = Cancel reverse video mode
- 1 = Enter reverse video mode

This command is valid for Range 1 and Range 2 fonts only. A change of fonts of the same range is permitted within a line; however, no font calls in a different range or with different scaling are permitted once reverse video mode is established. Video may be switched between normal and reverse mode within a line without affecting baseline alignment. No multisegment characters or logos can be accommodated in reverse video mode.

4.8.4 ADJUST INTENSITY (IN)

0271 185 B9

This command varies the intensity of the beam or adjusts intensity for the currently selected font. The two-byte operand specifies the amount of intensity adjustment in grade points. A positive value makes the typeset material darker and a negative value makes it lighter. All output from this point on is intensity adjusted. In the APS-5 a new CHANGE FONT command cancels any further intensity adjustment by this command. In the APS-μ5 a SET VERTICAL or HORIZONTAL SIZE cancels further intensity adjustments by this command.

APS-5: The change produced is dependent upon the particular system and scale factor in use. Exact adjustment must be arrived at empirically to suit individual requirements. Maximum change is limited to ±63.

APS-μ5: Sets the intensity register to the eight-bit value contained in the least significant byte of the operand.

4.8.5 REPEAT CHARACTER (RC)

0264 180 B4

Default Value: 0

REPEAT CHARACTER is used mainly for leadering. The two-byte operand specifies the number of times to repeat typesetting of the last character called before this command is encountered in the job stream. Any letterspacing that is in effect is repeated with each character. If a change-size command occurs between the last typeset character and the repeat command, the character repeated appears in the new size.

APS-5: If the REPEAT CHARACTER command is encountered before any characters in a job have been typeset, the typesetter repeats a vertical rule one spot wide by 18 points high every fourth stroke for the number of times specified. (This produces a pattern which is used for system checkout purposes. There are 180 lines per inch

for a 57- or 100-pica typesetter, or 150 lines per inch for a 70-pica.)

APS-μ5: If a REPEAT CHARACTER command is encountered before any characters in a job have been typeset, the APS-μ5 typesets a null byte (black box).

4.8.6 BEGIN WRONG READING MODE (WR)

0243 163 A3

Default: Right Reading

The two-byte operand of this command specifies the horizontal position of a new start-of-text margin. This margin position becomes the new zero reference margin for the typesetter. The operand value specified produces the same result as SET LEFT MARGIN, except that the default horizontal margin is on the right side of the page, and positive distances measure leftward from it. All type is set and all horizontal spacing commands are executed in reverse (right to left) from the margin. When BEGIN WRONG READING MODE has been set, the rest of the job becomes wrong-reading output. Wrong-reading mode may be cleared only by execution of another WRONG READING MODE command, the RESET command, or the START PAGE command, or by reinitializing the typesetter for the next job.

4.9 RECURSIVE AND SUBROUTINE

COMMANDS. When repetitive typesetting is necessary, the following commands may be used to reduce programming effort and minimize redundant input data.

The program provides eight string buffers addressed 0 through 7. Each of these buffers may be filled with 128 8-bit bytes of character and command codes. (These 1,024 bytes may be used as one buffer or in any incremental value up to 1,024 bytes.) The strings may contain any text or commands, including string execute commands, of almost any kind; each string is terminated by a CLOSE STRING command. The data within the string is not executed at the time of input.

4.9.1 RESERVE STRING (RS)

0265 181 B5

Default: None

The least significant three bits of the two-byte operand specify the address of one of eight string buffers (addressed 0 through 7) in which the data immediately following is to be stored. This data is not executed at the time of storage but remains unchanged until overwritten by a subsequent RESERVE STRING command of the same address or until the system is reinitialized. The data in the string (commands or text) may be executed repetitively using the EXECUTE STRING command

with a corresponding buffer number. Data stored in the buffer is terminated by a CLOSE STRING command.

From a programming standpoint, the string may be thought of as a subroutine of any combination of text which may be executed from the mainstream of the typesetting job or from another string. RESERVE STRING commands may not be placed within RESERVE STRING commands.

The program reserves 1024 bytes of contiguous storage for string buffers addressable in eight increments of 128 bytes each. The low-order addressed buffers may completely overlap and overwrite a buffer with a higher address. It is therefore the responsibility of the user to employ the string buffer capability with care.

For example, if a user should store a string consisting of 800 bytes in buffer 0, this would leave only buffer 7 available for use; its maximum allocated storage is 128 bytes. Storage in any of the other buffers (1, 2, 3, 4, 5, or 6) would destroy the string beginning in buffer 0. However, it should be remembered that storage in any buffer is permissible at any time if the data in any destroyed buffer is no longer to be executed.

4.9.2 EXECUTE STRING (ES)

0266 182 B6

The least significant three bits of the two-byte operand specify which of the eight string buffers (addressed 0 through 7) is to be executed. Execution of the string buffer is nondestructive. Nesting of EXECUTE STRING commands is permitted, but the user must ensure that the called string is in the proper format and that no more than one string makes use of the string counter.

Each string buffer has a pointer which indicates the beginning of the string when it is first stored. When the string is executed, the pointer is stepped with each item processed. When a CLOSE STRING command is detected, the pointer is reset to the beginning of that string and control is returned to the calling source, which may have been the mainstream of data or another string buffer. The string pointer of any buffer may also be reset with the RESET STRING POINTER command. Thus, a string may reexecute itself.

4.9.3 RESET STRING POINTER (RP)

0270 184 B8

The least significant three bits of the two-byte operand specify one of eight string buffers (addressed 0 through 7) whose pointer is to be reset to the first item in the string. This command is used within a string for performing iterations of itself or another string; it should be the final command in the string immediately preceding the CLOSE STRING command.

4.9.4 SET STRING COUNTER (SC)

0267 183 B7

Default Value: 1

The two-byte operand is stored in the string counter. This counter may be decremented by the DECREMENT COUNTER command.

4.9.5 DECREMENT COUNTER (DC)

0361 241 F1

This is a type 1 command. Its execution causes the counter to be decremented by one. If the counter is not equal to zero as a result of the decrement, the next item of data (command or text) is executed in sequence. If the counter is equal to zero as a result of the decrement, the next item of data (one text character or one command) is skipped and the counter is reset to one. The SET STRING COUNTER and DECREMENT COUNTER commands are useful in string buffers to control iterations and escapes from loops. The DECREMENT COUNTER command should precede the RESET STRING POINTER command.

4.9.6 CLOSE STRING (CS)

0360 240 F0

This type 1 command terminates storage of a variable-length string and closes that string after it is executed. The CLOSE STRING command causes the pointer of that string to be set at zero and control to be returned to the calling source.

4.9.7 MATRIX IN DATA STREAM (MX)

0311 201 C9

This type 3 command specifies and formulates logotype characters that are not in the user's font library. They are drawn in segments set by nibble data in the input stream. The following rules apply when using this command:

- (1) Any block of commands containing an MX call must be terminated by that logo call, followed by three words containing the number of segments of the logo, the horizontal scale, and the vertical scale.
- (2) The blocks following a command block terminated by an MX call sequence must all be nibble data until all such data for the called matrix has been set.
- (3) The first word of each block of data must be the block byte count.

- (4) Each new segment of a logo must start a new block.
- (5) The second word of the first block of a segment must contain the segment byte count.
- (6) No block may exceed 1,024 bytes.
- (7) The byte count in nibble blocks must be even.
- (8) The logo is typeset at the current position; any leading or spacing required for any reason (such as inexact negative position when scanning) must be done before the logo call.
- (9) No block may contain both commands and nibble data.
- (10) For the format of a command block, see APS-41 Scanner User's Manual (200593).

4.10 OPERATOR INTERFACE COMMANDS. The following commands interface directly or indirectly with the operator.

4.10.1 START PAGE (SP)

0273 187 BB

The two-byte operand specifies the page number, from 1 to 9999, of the information that follows the command. When the typesetter encounters this command, the page number is displayed on the Operator's Control Panel page number display. This command also invokes the RESET command.

APS-5: The Page Search feature uses the START PAGE command and the Operator's Control Panel in selecting a page or sequence of pages to be typeset. The page search feature includes two banks of thumbwheel switches on the Operator's Control Panel, one labeled STARTING and the other ENDING, with which the operator sets the starting and ending page numbers. Adjacent to the thumbwheel switches is a pushbutton labeled TAPE SEARCH. If after initializing the typesetter the operator presses the TAPE SEARCH pushbutton instead of the PROCEED pushbutton, the typesetter searches the input for the START PAGE command. When it finds the command, it compares the binary value given in the two-byte operand with the value set in the STARTING page number thumbwheel switch. If the values are equal, the typesetter begins to set type at that page. It then compares the page number of each page it sets with the four-digit number entered in the ENDING page number switch.

When it finds a page number equal to that value, it completes that page and then halts. Thus, if

the switches were set for a starting page number of 11 and an ending page number of 11, the typesetter would set only page 11. If they were set for a starting page number of 11 and an ending page number of 19 the typesetter would set pages 11 through 19, inclusive.

The starting and ending page numbers can only be entered by pressing the TAPE SEARCH pushbutton. Once the operator has pressed PROCEED, changing the thumbwheel switches has no effect on operation.

Since the START PAGE command invokes RESET, each page should be treated as a separate job, headed with sufficient information to specify all typographic conditions (font, type size, stored values, setup information, etc.) for typesetting that page. If page setup is identical for all pages of a job, the setup data may be loaded into a string buffer by a RESERVE STRING command that precedes the first page command of the job. The string may then be executed immediately following each page command in the job, thus minimizing redundant input data.

Page numbers need not be sequential on a tape. The tape search logic simply looks for the starting page number, then for the ending page number. These numbers must be no larger than four digits, and the ending page number must follow the starting page number on the input tape. Since the switches allow for only four digits, pages are numbered from 1 to 9999.

NOTE

The START PAGE command is used in the Microfilm Recording Unit to cause a frame advance.

NOTE

START PAGE causes a HALT if APS-VIEW is selected as the output device.

APS-μ5: The two-byte operand specifies the page number, from 1 to 9999, of the information that follows the command. When the typesetter encounters this command, the page number is displayed on the Operator's Control Panel page number display. This command also invokes the RESET command.

4.10.2 END OF JOB (EJ)

0376 254 FE

Strictly speaking, an END OF JOB command is not required; a job can terminate without it. However, it is recommended for a number of reasons.

With paper tape input, the END OF JOB command causes the typesetter to halt and display END OF JOB on the Operator's Control Panel. The typesetter must now be reinitialized before the next job may be run.

(With APS- μ 5, see description of POS 7 below).

If there is no END OF JOB command at the end of a take, the typesetter stops only when it runs out of paper tape. This mode of operation can be useful for stringing a number of jobs on the same input tape and freeing the operator from having to press the INITIAL and PROCEED pushbuttons after each job. When the END OF JOB command is omitted, the typesetter treats everything it encounters as one long job; therefore, each job on the input tape should start with its own setup and typographic commands to clear the typesetter of stored conditions from the previous job. Each job should also start with some amount of media advance to separate it on the output medium from the preceding take.

If the END OF JOB command is used and the typesetter is reinitialized after each job, there is automatic leading. Pressing the INITIAL pushbutton automatically clears all stored typographic conditions and causes the medium to advance approximately 2 inches between jobs.

With magnetic tape input, when the typesetter encounters the END OF JOB command it executes a RESET command and continues to read magnetic tape data until two file marks are read. It then displays END OF JOB. (With APS- μ 5, see description of POS 7 below).

With on-line input, an END OF JOB command causes the typesetter to go off-line and stop. The INITIAL and PROCEED pushbuttons must be pressed to restart on-line. A RESET command allows the typesetter to wait for further input. (With APS- μ 5, see description of POS 7 below).

APS- μ 5: Program Option Switch (POS) 7 controls END OF JOB action and allows the following options:

- 0 = (Default) stop typesetting and display END OF JOB. If PROCEED is pressed, the system is initialized just as if INITIALIZE had been pressed.
- 1 = Continue polling input device for next job.

4.10.3 CUT MEDIA (CM)*

0374 252 FC

CUT MEDIA is a type 1 command that schedules a media cut if the proper hardware is present on the system

and if the proper options have been set. CUT MEDIA schedules a cut that will be activated when a START PAGE command is encountered in the data stream and the cut point has passed the cutter blade.

If an excess of media (more than 44 in.) has entered the transporter, an automatic cut is made. If the leading since the last cut is less than the minimum of 12 inches of leading before the cut, the media is advanced before the cut is made.

When END OF JOB is encountered, all pending cuts are executed at their requested points. If the last page is short, the media is leaded to 12 inches and then cut.

APS-5: The typesetter must be in Transport Mode with the proper DIP switches set (see DCOS Operator's Manual, 200635) or in Darkroom Mode.

APS- μ 5: CUT MEDIA is not operational at this time.

4.10.4 HALT (HT)

0375 253 FD

This command is handled differently in the APS-5 and the APS- μ 5:

APS-5: This type-1 command causes the typesetter to halt. The operator may restart the job with no loss of data by pressing the PROCEED pushbutton, or may terminate the job by pressing the INITIAL pushbutton.

APS- μ 5: POS 6 affects the ICL (software) HALT command and allows the following settings:

- 0 = (Default) stop job processing and display HALT-INPUT. If PROCEED is pressed, the machine resumes processing.
- 1 = Continue typesetting until a RETURN BEAM or CARRIAGE RETURN command is detected, stop typesetting, and display HALT-INPUT. If PROCEED is pressed, the machine resumes typesetting.
- 2 = Continue typesetting until a START PAGE command is detected, stop typesetting, and display HALT-INPUT. If PROCEED is pressed, the machine resumes typesetting.

4.11 UTILITY COMMANDS.

4.11.1 RESET (RI)

0356 238 EE

This command causes system constants to be reset to the following default values:

Constant	Reset Value
Font	Font 000 is selected as the current font.
Point Size	Master size for Range 1 fonts is selected.
Left Margin	Default position, margin is 0000.
Vertical Mark	Set to the current baseline or beam position.
Horizontal Mark	Set to the default left margin.
Letterspace	Letterspace value of 0 is stored.
Oblique Mode	Oblique cancelled; normal mode restored.
Oblique Angle	Positive degrees (default) restored.
Right Reading	Right-reading mode (default) restored.

4.11.2 SKIP DATA (SB)

0317 207 CF

This command skips the number of bytes specified in the two bytes following the command. The maximum number of bytes skipped is 32,767.

4.11.3 DISPLAY FONT (DF)

0257 175 AF

This command is followed by two bytes giving the number of the font to be displayed; it causes the typesetter to display that font number followed by all 128 of its characters.

Any of the 128 positions that are empty are represented by a solid black rectangle. Existing size specifications determine the size of the displayed characters.

This display can be activated without ICL input through procedures described in:

APS-5: DCOS Operating Procedures (#200635).

APS-μ5: APS-Micro 5 Supervisor's Manual (#200590).

4.11.4 DISPLAY ALL FONTS (AF)

0357 239 EF

This command causes the typesetter to display all fonts on the disk (called a font dump) in font number sequence. Fonts are displayed in normal mode at master size.

This display can be activated without ICL input through procedures described in:

APS-5: DCOS Operating Procedures (#200635).

APS-μ5: APS-Micro 5 Supervisor's Manual (#200590).

5.0 SPECIAL-PURPOSE COMMANDS

5.1 MICROFILM RECORDING UNIT (MRU)

COMMANDS. The following commands are used only with the Microfilm Recording Unit (MRU), an optional piece of hardware.

5.1.1 SET MRU ZOOM FACTOR (ZF)*

0306 198 C6

This command contains a value which adjusts the size of the image on the microfilm. In effect, it modifies the scale factor described under FONT SIZING AND NUMBERING, and therefore is part of all calculations. Point-size calculation is affected, and the rules for font scaling (see para. 2.3.2 Scale Factor) still apply.

The zoom factor must include the ratio R defined below. R applies to each of the vertical and horizontal directions, independently, and is the ratio of image size on the MRU tube face to image size on the typesetter tube face for the same data projected on standard media.

$$R = \frac{LR \times MFW \times LM}{MW} = (LR \times LM) \times RF$$

Where:

LR = MRU Lens reduction factor

MFW = Microfilm image width

LM = Standard typesetter lens magnification
(2.222 or 2.667)

MW = Standard typesetter media image width

RF = MFW/MW = reduction factor

The value submitted to the ZF command is: R x 8192.

The following considerations are helpful:

- (1) The product (LR x LM) for various machine configurations is:

Typesetter Size Limit	LM	MRU (mm)	LR	(LR x LM)
57/100	2.222	35	1.95	4.333
		35 or 16	5.5	12.22
		16	8.0	17.78
70	2.667	35	1.95	6.200
		35 or 16	5.5	14.67
		16	8.0	21.33

- (2) The value of (LR x MFW), the size of the page on the tube face, must be no greater than 3 inches.

- (3) The vertical and horizontal values of MFW must be smaller than these maximum values:

Film	Vertical in inches (across the film)	Horizontal in inches (along the film)
16mm	0.44	0.55
35mm sprocketed	0.97	1.467
35mm unsprocketed	1.133	1.467

5.1.2 SET MRU MARGIN (MU)*

0307 199 C7

The microfilm does not move during creation of a frame, so it is necessary to define the position of the page on the tube face.

This command is followed by two values (requiring 4 bytes) which specify the upper left corner of the page. The first value is the distance left (negative) or right (positive) of the left margin from the center of the page. The second value is the distance up (negative) or down (positive) of the top margin from the center of the page.

In each case, the value given is:

$$N = K(LR \times LM) \times (MW \times RF)$$

Where:

$K = 361.5$ for 57/100-pica machines

$K = 301.2$ for 70-pica machines

and other variables are defined above.

The default for this command is the center of the page. The margin values set by this command remain in effect until redefined by a subsequent command of the same type. This command not only defines the margins, it also positions the beam at the top left corner of the page.

5.1.3 SET MRU FRAME PULLDOWN (PD)*

0310 200 C8

Default value: 732

The pulldown value is the distance between successive pages or frames on the microfilm. The two-byte operand specifies the necessary pulldown value in thousandths of an inch. All typesetting on microfilm is done when the film is stationary; the film is moved by a distance equal to the stored pulldown value only when a START PAGE command is encountered. If the MRU is being operated in the perforated mode, the distance moved from the top of one frame to the top of the next is always an exact number of perforations.

The system default is 732, corresponding to a distance of 0.732 inch, or just under four perforations for 35-mm perforated film.

If this command is used on an APS-52 Microfiche Recording Unit, it causes a fiche frame advance. The operand is ignored.

5.1.4 SET MRU ADVANCE IMAGE (MI)*

0312 202 CA

This type 2 command applies to the APS-52 Microfiche Recording Unit only. When the APS-52 microfiche is present, the fiche is advanced and the camera is positioned to the next image.

The two-byte operand is ignored.

The command causes an image advance on the fiche by moving the camera. After 350 images, the command causes the hardware to position the camera to the first image of the next fiche in lieu of the frame pulldown command (0310).

5.2 APS-VIEW MODE. Default, or typesetting, mode is set by the operating system within the typesetter

when the machine is bootstrap loaded. The machine is configured for APS-VIEW mode through the following command:

5.2.1 SET PROGRAM MODE (PM)*

0314 204 CC

This type-2 command allows the following two-byte operand values which allow both entry and exit from APS-VIEW mode:

00 = Typesetter mode

05 = APS-VIEW mode

Mode selection should be made before the START PAGE command, which causes a HALT in APS-VIEW mode, is encountered in the data stream.

Jobs run on the APS-VIEW should contain sufficient START PAGE commands to ensure that the maximum page length allowance (720 points) is not exceeded.

5.3 GRAPHICS MODE. The graphics mode provides for phototypesetting of graphic material that has been formatted for input to the typesetter.

Graphic material is organized into units termed "drawings". Each drawing is incorporated into a typeset page by means of a BEGIN DRAWING MODE (DW) command in the job stream. The job stream may be coming from magnetic tape unit 0 (DMA mode) or the paper tape reader/on-line port (PIO mode).

The drawing(s) may follow the DW command in the in-line job stream or may reside on magnetic tape unit 1. In the latter case, individual drawings may be selected based upon user-supplied information in the Parameter List (PL) and the Optional Flag Word (OFW). These items are discussed fully in para. 5.3.1 which describes the DW command and its options.

Upon entering the drawing mode, the current beam position becomes the drawing origin (nominally, the upper left corner of the drawing) and also specifies the left margin. After a drawing has been processed, typesetting resumes at the point where it was interrupted by the DW command. The left margin is also restored to its previous value.

Each drawing, whether it occurs on-line or on magnetic tape unit 1, is prefixed by a graphics header (GH) defined in Table 5-1.

NOTE

In Table 5-1 the first four bytes apply to block length for magnetic tape only.

When the drawings are on tape unit 1, the header is an 84-byte block followed by one or more blocks of

graphics data, each no more than 8192 bytes long. Physically, tape format is that shown in Figure 2-4, Individual Block Format: each drawing is preceded by a file mark and the last drawing is followed by two file marks (EOT). Continuation tapes are not allowed.

For in-line drawings from PIO input (PTR/On-line port), the drawing command is immediately followed by an 80-byte graphics header (see NOTE above) and then the drawing information. Drawing data must be terminated by an exit drawing (XD) command.

Drawings that occur in-line from magnetic tape unit 0 contain graphics headers (GHs) and data formats that are the same as those discussed below in *Graphics Format*, with the following exceptions:

- Block length is limited to 1024 bytes (vs. 8192) and file marks are not required.

- The Skip Drawing and Match/Search features are not available.

Graphics Format.

The Graphics Header (GH) consists of the fields indicated in Table 5-1, each defined by position, name, length, and format.

Graphic data consists of commands (either type 1 or type 2) interspersed with graphic data byte-pairs. Table 5-2 defines the format of these byte-pairs and the technique used to generate the drawing on the medium. For line-art data, two special fonts (1070 and 1071) are used.

Within the graphic data, certain typesetter commands control processing, as follows:

Table 5-1. Graphics Header (GH) Block Format

Position (bytes)	Field Name	Length (bytes)	Format	Legal Values	Comments
1-2	Block Length	2	Binary	84	Applies to magnetic tape only.
3-4	--	2	----	----	Mag tape only. These fields are not sensed by the typesetter, but used by other programs.
5-24	Drawing Name	20	ASCII		Used for Match.
25-28	Drawing Revision	4	ASCII		Used for Match.
29-30	Drawing Sequence No.	2	Binary	1-199	Used for Match.
31-32	Vertical Scale Factor (See comments for legal scaling.)	2	Binary	2048-10,240	8192 represents unity scale. Will be combined with vertical scale factor in the parameter list (see 5.3.1). APS-5A, 5U: 4096-10,240 APS-5C: 2048-8192
33-34	Horizontal Scale Factor (See comments for legal scaling.)	2	Binary	2048-10,240	8192 represents unity scale. Will be combined with horizontal scale factor in the parameter list (see 5.3.1). APS-5A, 5U: 4096-10,240 APS-5C: 2048-8192
35-36	Font A No.	2	Binary		May be optionally superseded by value in parameter list.
37-38	Font B No.	2	Binary		May be optionally superseded by value in parameter list.
39-40	Vertical Size	2	Binary		Size in spots (see UNITS OF MEASURE).
41-42	Horizontal Size	2	Binary		Size in spots (see UNITS OF MEASURE).
43-72	Drawing Description	30	ASCII		These fields not sensed by typesetter, but used by other programs.
73-84	Publication Code	12	ASCII		These fields not sensed by typesetter, but used by other programs.

- a. VERTICAL SPACE IN SCALED SPOTS is used to generate the leading for the swath depth.
- b. RETURN BEAM TO LEFT MARGIN is used to end a swath of data and cause the beam to return to the graphics margin; CARRIAGE RETURN may not be used, because scaled spots are required for vertical positioning.
- c. ESCAPE DRAWING MODE is used to end a drawing, reposition the beam and media, and cause the typesetter to exit the graphics mode.

The typesetter allows additional commands to be executed within the drawing data stream. For example, HORIZONTAL SPACE IN SCALED SPOTS must be used for white space within a drawing.

Table 5-2. Line-Art Graphic Data Byte-Pair Format

Byte	Bit	Field Name
1	0	Spot 8*
	1	Spot 7
	2	Spot 6
	3	Spot 5
	4	Spot 4
	5	Spot 3
	6	Spot 2
	7	Spot 1**
2	0	Spot 1**
	1 thru 7	Repeat count***

* The drawing is composed of horizontal swaths eight spots high which are painted left-to-right. Each swath lies below the preceding one. Each byte-pair defines a swath element one spot wide and eight spots high. Spots are numbered downward, from 1 through 8. The drawing origin is spot 1 of the first swath element.

** For the spot pattern consisting solely of spot 1: byte 1, bit 7 is set and byte 2, bit 0 is clear. For all other spot patterns containing spot 1: byte 1, bit 7 is clear, and byte 2, bit 0 is set. If byte 1 has a value greater than 128, the value represents a command, rather than graphics data, and byte 2 is omitted.

*** Values of 1 through 127 represent the number of times this swath element is to be repeated to the right of the current position.

NOTE

Bit 7 is the most significant bit of a byte.

Certain typesetter commands are not allowed within graphics data:

- Change font commands
- Set horizontal size commands
- Set vertical size commands
- Set point size commands

NOTE

Results are undefined if these commands are used when setting graphics data.

5.3.1 BEGIN DRAWING MODE (DW)*

0221 145 91

This command sets drawing mode, which remains in effect until an ESCAPE DRAWING MODE command is processed. Immediately following the DW command is the parameter list (PL) associated with the command. The format of the PL is given in Table 5-3.

The PL may contain an option flag word, defined in Table 5-4, which specifies which parameters are present and to be used in processing the drawing. The scale factors given in the graphics header and parameter list are multiplied to produce the value used for processing the drawing.

NOTE

A previous DW command must have been terminated by an XD command. Failure to do so will cause a typesetter HALT with ILLEGAL COMMAND displayed on the Operator's Control Panel.

If the skip-drawing function is specified, no graphics data is placed on the medium. However, if the vertical scale factor in the PL is non-zero, the drawing name and drawing revision are typeset (in font 0), left-justified and centered vertically.

NOTE

The drawing area, for these purposes, is as specified by the vertical size and horizontal size in the GH.

Required/Optional Fields.

Byte positions 1 thru 6 are required (i.e., either used or null); the remaining fields are optional. However, in order for an optional field to be processed, the OFW bit (see Table 5-4) corresponding to that field *must* be set and all fields that precede the option must be supplied. For example, if the Drawing Name option (byte positions 15 thru 34) is used, OFW bit 2 must be set and the proper values for byte positions 1 thru 14 must be supplied.

Within Table 5-3 the OFW bit that must be set in order for the option to be processed is given in parentheses in the Field Name column.

NOTE

The content of a field is ignored unless the corresponding OFW bit is set.

Combined Scale Factor.

The values of the (PL) scale factor and the corresponding graphics header scale factor are combined to form the scale factor for drawing mode. The values entered in each list must result in a combined scale factor that is in the range 0.5 through 1.25 for the APS-5A and

5U and 0.25 through 1.0 for the APS-5C. The values are computed through the following equation:

$$SF = (GH \text{ Scale} / 8192) * (PL \text{ Scale} / 8192)$$

Unity scale for drawing mode is specified by entering 8192 in both the Graphics Header and the Parameter List since $8192/8192 * 8192/8192 = 1$.

The Optional Flag Word format allows the user to manipulate drawing formats for a particular job without reformatting the graphics header.

Based on the bits set in the OFW field of the PL and the information provided in the OFW itself, the user may select the options defined in Table 5-4.

Table 5-3. Parameter List (PL) for BEGIN DRAWING MODE

Position (bytes)	Field Name	Length (bytes)	Format	Value	Comments
1-2	Size of this Parameter List	2	Binary	2 thru 40	Includes these two bytes.
3-4	(reserved)	2		0	Optional or zero.
5-6	Option Flag Word (OFW)	2	Bit pattern	(See Table 5-4)	Zero or bit(s) set (see Required/Optional Fields below).
7-8	Vertical Scale Factor (1)	2	Binary	2048-10,240	8192 represents unity. See Combined Scale Factor below.
9-10	Horizontal Scale Factor (1)	2	Binary	2048-10,240	8192 represents unity. See Combined Scale Factor below.
11-12	Font A No. (6)	2	Binary		Supersedes value given in GH.
13-14	Font B No. (6)	2	Binary		Supersedes value given in GH.
15-34	Drawing Name (2)	20	ASCII		Used for Match.
35-38	Drawing Revision (3)	4	ASCII		Used for Match.
39-40	Drawing Sequence No. (4)	2	Binary	1 thru 999	Used for Match.

Table 5-4. Option Flag Word (OFW) Format

Bit	Function Name	Function Description
0	Skip drawing	Omit the graphic data for one drawing (skip over it). Instead, print the drawing name and drawing revision at the location specified for the drawing.
1	Scale drawing	Use the scale factors in the parameter list (PL) and graphics header (GH), multiplied together. (See Table 5-4, Notes.)
2	Match drawing name	Compare the drawing names in the PL and GH.
3	Match drawing revision	Compare the drawing revisions in the PL and GH.
4	Match drawing sequence no.	Compare the drawing sequence numbers in the PL and GH.
5	Search for a drawing	Search for a GH which matches the PL. Only those fields are compared which are specified by bits 2, 3, 4 of the OFW. (This function is honored only if the graphic data is read from the alternate mag tape unit; i.e., OFW bit 15 is set.)
6	Specify fonts	Use the PL fonts rather than the GH fonts.
15	Alternate data device	The GH and graphic data are on magnetic tape unit 1, rather than following the PL.

NOTE

Bit 0 is the least significant bit. Given above is the function corresponding to each bit being set.

Any of the three Match functions may be submitted, in any combination. Only those submitted are used in performing the match operation. If the Search function is not given, or if the drawing follows the parameter list, the next drawing must match, or a no-match condition exists.

If Search is specified for a drawing on magnetic tape unit 1, each graphics header is examined for a match until all the drawings from the beginning to the end of the tape (double file mark) have been examined.

In the event of a no-match condition, the words NOT FOUND are typeset below the drawing origin, and TAPE ERROR is displayed on the Operator's Control Panel. (The operator may then press PROCEED to continue.)

5.3.2 ESCAPE DRAWING MODE (XD)*

0366 246 F6

This type 1 command terminates the drawing mode, thereby restoring the left margin and beam position to the values in effect before the previous DW command was processed.

The XD command must always be the last byte of the drawing.

APPENDIX A

STANDARD CHARACTERS

Table A-1. Standard Characters

Octal	Decimal	Hex.	Graphic	Octal	Decimal	Hex.	Graphic
001	1	01	A	041	33	21	g
002	2	02	B	042	34	22	h
003	3	03	C	043	35	23	i
004	4	04	D	044	36	24	j
005	5	05	E	045	37	25	k
006	6	06	F	046	38	26	l
007	7	07	G	047	39	27	m
010	8	08	H	050	40	28	n
011	9	09	I	051	41	29	o
012	10	0A	J	052	42	2A	p
013	11	0B	K	053	43	2B	q
014	12	0C	L	054	44	2C	r
015	13	0D	M	055	45	2D	s
016	14	0E	N	056	46	2E	t
017	15	0F	O	057	47	2F	u
020	16	10	P	060	48	30	v
021	17	11	Q	061	49	31	w
022	18	12	R	062	50	32	x
023	19	13	S	063	51	33	y
024	20	14	T	064	52	34	z
025	21	15	U	065	53	35	1
026	22	16	V	066	54	36	2
027	23	17	W	067	55	37	3
030	24	18	X	070	56	38	4
031	25	19	Y	071	57	39	5
032	26	1A	Z	072	58	3A	6
033	27	1B	a	073	59	3B	7
034	28	1C	b	074	60	3C	8
035	29	1D	c	075	61	3D	9
036	30	1E	d	076	62	3E	0
037	31	1F	e	077	63	3F	\$
040	32	20	f	100	64	40	¢

Table A-1. Standard Characters (Continued)

Octal	Decimal	Hex.	Graphic	Octal	Decimal	Hex.	Graphic
101	65	41	&	110	72	48	?
102	66	42	:	111	73	49	!
103	67	43	;	112	74	4A	%
104	68	44	.	113	75	4B	*
105	69	45	,	114	76	4C	(
106	70	46	'	115	77	4D	)
107	71	47	'	116	78	4E	/

APPENDIX B

ALPHABETICAL, NUMERICAL,

AND FUNCTIONAL INDEX OF COMMAND CODES

Table B-1. Alphabetical Command Code Index

Mnemonic	Function	Type	Octal	Decimal	Hex.	Page
#A	Execute Horizontal Space A	1	0352	234	EA	11
#B	Execute Horizontal Space B	1	0353	235	EB	11
#C	Execute Horizontal Space C	1	0354	236	EC	11
#D	Execute Horizontal Space D	1	0355	237	ED	11
A#	Store Horizontal Space A	2	0332	218	DA	11
AF	Display All Fonts	1	0357	239	EF	18
AH	Store Horizontal of Rule A	2	0326	214	D6	13
AV	Store Vertical of Rule A	2	0325	213	D5	12
B#	Store Horizontal Space B	2	0333	219	DB	11
BH	Store Horizontal of Rule B	2	0330	216	D8	13
BV	Store Vertical of Rule B	2	0327	215	D7	13
C#	Store Horizontal Space C	2	0334	220	DC	11
CF	Change Font	2	0260	176	B0	7
CL	Change and Lock Font	2	0255	173	AD	7
CM	Cut Media	1	0374	252	FC	17
CR	Carriage Return	1	0342	226	E2	9
CS	Close String	1	0360	240	F0	15
D#	Store Horizontal Space D	2	0335	221	DD	11
DC	Decrement Counter	1	0361	241	F1	15
DF	Display Font	2	0257	175	AF	18
DW	Begin Drawing Mode	3	0221	145	91	22
EH	Horizontal Space of 18 Points	1	0210	136	88	11
EJ	End of Job	1	0376	254	FE	16
ES	Execute String	2	0266	182	B6	15
FH	Horizontal Space of 4-1/2 Points	1	0212	138	8A	11
HA	Horizontal Space Absolute	2	0302	194	C2	10
HE	Horizontal Space of 100 Units	1	0204	132	84	11
HH	Horizontal Space of 400 Units	1	0202	130	A2	11
HI	Horizontal Space of 25 Units	1	0201	129	81	11
HM	Return to Horizontal Mark	1	0337	223	DF	12
HQ	Horizontal Space of 200 Units	1	0203	131	83	11
HR	Horizontal Space Relative	2	0303	195	C3	10

Table B-1. Alphabetical Command Code Index (Continued)

Mnemonic	Function	Type	Octal	Decimal	Hex.	Page
HS	Horizontal Space in Scaled Spots	2	0277	191	BF	10
HT	Halt	1	0375	253	FD	17
HX	Horizontal Space of 50 Units	1	0205	133	85	11
HZ	Set Horizontal Size	2	0261	177	B1	8
IN	Adjust Intensity	2	0271	185	B9	14
LA	Letterspace Absolute	2	0304	196	C4	11
LR	Letterspace Relative	2	0305	197	C5	11
LT	Execute Rule A to Tab	1	0346	230	E6	13
MA	Set Left Margin	2	0244	164	A4	9
MH	Mark Horizontal Position	1	0336	222	DE	12
MI	Set MRU Advance Image	2	0312	202	CA	20
ML	Mark Location	2	0217	143	8F	12
MU	Set MRU Margin	3	0307	199	C7	19
MV	Mark Vertical Position	1	0362	242	F2	11
MX	Matrix in Data Stream	3	0311	201	C9	15
NE	Horizontal Space of 9 Points	1	0211	137	89	11
NM	Normal Mode	1	0350	232	E8	8
OA	Set Oblique Angle	2	0242	162	A2	8
OM	Oblique Mode	1	0351	233	E9	8
PD	Set MRU Frame Pulldown	2	0310	200	C8	20
PH	Position Horizontal Absolute	2	0315	205	CD	12
PL	Page Lead Immediate Vertical	2	0313	203	CB	12
PM	Set Program Mode	2	0314	204	CC	20
PV	Position Vertical Absolute	2	0316	206	CE	12
PZ	Set Point Size	2	0263	179	B3	7
RB	Return Beam to Left Margin	1	0341	225	E1	9
RC	Repeat Character	2	0264	180	B4	14
RH	Return to H-Location	2	0222	146	92	12
RI	Reset	1	0356	238	EE	18
RL	Return to Location	2	0220	144	90	12
RM	Return to Vertical Mark	1	0363	243	F3	12
RP	Reset String Pointer	2	0270	184	B8	15

Table B-1. Alphabetical Command Code Index (Continued)

Mnemonic	Function	Type	Octal	Decimal	Hex.	Page
RS	Reserve String	2	0265	181	B5	14
RT	Set Retrace	2	0245	165	A5	13
RV	Return to V-Location	2	0223	147	93	12
SB	Skip Data	2	0317	207	CF	18
SC	Set String Counter	2	0267	183	B7	15
SD	Vertical Space in Spots	2	0176	190	BE	10
SI	Shift In	1	0365	245	F5	8
SL	Shift Level	2	0224	148	94	8
SO	Shift Out	1	0364	244	F4	8
SP	Start Page	2	0273	187	BB	16
SR	Store Vertical Spots	2	0321	209	D1	10
ST	Set Tab	2	0323	211	D3	9
SV	Horizontal Space of 72 Points	1	0206	134	86	11
TB	Tab	1	0343	227	E3	9
TC	Tab Carriage Return	1	0344	228	E4	9
TS	Horizontal Space of 36 Points	1	0207	135	87	11
UE	End Underline Mode	1	0367	247	F7	13
UF	Unlock a Font	2	0256	174	AE	7
UL	Begin Underline Mode	2	0247	167	A7	13
V#	Store Vertical Space	2	0320	208	D0	10
VA	Vertical Space Absolute	2	0300	192	C0	10
VR	Vertical Space Relative	2	0301	193	C1	10
VS	Vertical Space in Scaled Spots	2	0275	189	BD	10
VZ	Set Vertical Size	2	0262	178	B2	7
WR	Begin Wrong Reading Mode	2	0243	163	A3	14
XA	Execute Rule A	1	0345	229	E5	13
XB	Execute Rule B	1	0347	231	E7	13
XD	Escape Drawing Mode	1	0366	246	F6	24
XS	Execute Stored Vertical Space	1	0340	224	E0	10
ZF	Set MRU Zoom Factor	2	0306	198	C6	19

Table B-2. Numerical Command Code Index

Octal	Decimal	Hex.	Type	Mnemonic	Function	Page
0000	000	00	1	--	No Operation	6
0001	001	01		--	Character Codes	
0200	128	80		--	Character Codes	
0201	129	81	1	HI	Horizontal Space of 25 Units	11
0202	130	82	1	HH	Horizontal Space of 400 Units	11
0203	131	83	1	HQ	Horizontal Space of 200 Units	11
0204	132	84	1	HE	Horizontal Space of 100 Units	11
0205	133	85	1	HX	Horizontal Space of 50 Units	11
0206	134	86	1	SV	Horizontal Space of 72 Points	11
0207	135	87	1	TS	Horizontal Space of 36 Points	11
0210	136	88	1	EH	Horizontal Space of 18 Points	11
0211	137	89	1	NE	Horizontal Space of 9 Points	11
0212	138	8A	1	FH	Horizontal Space of 4-1/2 Points	11
0217	143	8F	2	ML	Mark Location	12
0220	144	90	2	RL	Return to Location	12
0221	145	91	3	DW	Begin Drawing Mode	22
0222	146	92	2	RH	Return to H-Location	12
0223	147	93	2	RV	Return to V-Location	12
0224	148	94	2	SL	Shift Level	8
0242	162	A2	2	OA	Set Oblique Angle	8
0243	163	A3	2	WR	Begin Wrong Reading Mode	14
0244	164	A4	2	MA	Set Left Margin	9
0245	165	A5	2	RT	Set Retrace	13
0247	167	A7	2	UL	Begin Underline Mode	13
0255	173	AD	2	CL	Change and Lock Font	7
0256	174	AE	2	UF	Unlock a Font	7
0257	175	AF	2	DF	Display Font	18
0260	176	B0	2	CF	Change Font	7
0261	177	B1	2	HZ	Set Horizontal Size	8
0262	178	B2	2	VZ	Set Vertical Size	7
0263	179	B3	2	PZ	Set Point Size	7
0264	180	B4	2	RC	Repeat Character	14

Table B-2. Numerical Command Code Index (Continued)

Octal	Decimal	Hex.	Type	Mnemonic	Function	Page
0265	181	B5	2	RS	Reserve String	14
0266	182	B6	2	ES	Execute String	15
0267	183	B7	2	SC	Set String Counter	15
0270	184	B8	2	RP	Reset String Pointer	15
0271	185	B9	2	IN	Adjust Intensity	14
0273	187	BB	2	SP	Start Page	16
0275	189	BD	2	VS	Vertical Space in Scaled Spots	10
0276	190	BE	2	SD	Vertical Space in Spots	10
0277	191	BF	2	HS	Horizontal Space in Scaled Spots	10
0300	192	C0	2	VA	Vertical Space Absolute	10
0301	193	C1	2	VR	Vertical Space Relative	10
0302	194	C2	2	HA	Horizontal Space Absolute	10
0303	195	C3	2	HR	Horizontal Space Relative	10
0304	196	C4	2	LA	Letterspace Absolute	11
0305	197	C5	2	LR	Letterspace Relative	11
0306	198	C6	2	ZF	Set MRU Zoom Factor	19
0307	199	C7	3	MU	Set MRU Margin	19
0310	200	C8	2	PD	Set MRU Frame Pulldown	20
0311	201	C9	3	MX	Matrix in Data Stream	15
0312	202	CA	2	MI	Set MRU Advance Image	20
0313	203	CB	2	PL	Page Lead Immediate Vertical	12
0314	204	CC	2	PM	Set Program Mode	20
0315	205	CD	2	PH	Position Horizontal Absolute	12
0316	206	CE	2	PV	Position Vertical Absolute	12
0317	207	CF	2	SB	Skip Data	18
0320	208	D0	2	V#	Store Vertical Space	10
0321	209	D1	2	SR	Store Vertical Spots	10
0323	211	D3	2	ST	Set Tab	9
0325	213	D5	2	AV	Store Vertical of Rule A	12
0326	214	D6	2	AH	Store Horizontal of Rule A	13
0327	215	D7	2	BV	Store Vertical of Rule B	13
0330	216	D8	2	BH	Store Horizontal of Rule B	13
0332	218	DA	2	A#	Store Horizontal Space A	11

Table B-2. Numerical Command Code Index (Continued)

Octal	Decimal	Hex.	Type	Mnemonic	Function	Page
0333	219	DB	2	B#	Store Horizontal Space B	11
0334	220	DC	2	C#	Store Horizontal Space C	11
0335	221	DD	2	D#	Store Horizontal Space D	11
0336	222	DE	1	MH	Mark Horizontal Position	12
0337	223	DF	1	HM	Return to Horizontal Mark	12
0340	224	E0	1	XS	Execute Stored Vertical Space	10
0341	225	E1	1	RB	Return Beam to Left Margin	9
0342	226	E2	1	CR	Carriage Return	9
0343	227	E3	1	TB	Tab	9
0344	228	E4	1	TC	Tab Carriage Return	9
0345	229	E5	1	XA	Execute Rule A	13
0346	230	E6	1	LT	Execute Rule A to Tab	13
0347	231	E7	1	XB	Execute Rule B	13
0350	232	E8	1	NM	Normal Mode	8
0351	233	E9	1	OM	Oblique Mode	8
0352	234	EA	1	#A	Execute Horizontal Space A	11
0353	235	EB	1	#B	Execute Horizontal Space B	11
0354	236	EC	1	#C	Execute Horizontal Space C	11
0355	237	ED	1	#D	Execute Horizontal Space D	11
0356	238	EE	1	RI	Reset	18
0357	239	EF	1	AF	Display All Fonts	18
0360	240	F0	1	CS	Close String	15
0361	241	F1	1	DC	Decrement Counter	15
0362	242	F2	1	MV	Mark Vertical Position	11
0363	243	F3	1	RM	Return to Vertical Mark	12
0364	244	F4	1	SO	Shift Out	8
0365	245	F5	1	SI	Shift In	8
0366	246	F6	1	XD	Escape Drawing Mode	24
0367	247	F7	1	UE	End Underline Mode	13
0374	252	FC	1	CM	Cut Media	17
0375	253	FD	1	HT	Halt	17
0376	254	FE	1	EJ	End of Job	16
0377	255	FF	1	--	No Operation	6

Table B-3. Functional Command Code Index

Function	Mnemonic	Page
Adjust Intensity	IN	14
Begin Drawing Mode	DW	22
Begin Underline Mode	UL	13
Begin Wrong Reading Mode	WR	14
Carriage Return	CR	9
Change Font	CF	7
Change and Lock Font	CL	7
Close String	CS	15
Cut Media	CM	17
Decrement Counter	DC	15
Display All Fonts	AF	18
Display Font	DF	18
End of Job	EJ	16
End Underline Mode	UE	13
Escape Drawing Mode	XD	24
Execute Horizontal Space A	#A	11
Execute Horizontal Space B	#B	11
Execute Horizontal Space C	#C	11
Execute Horizontal Space D	#D	11
Execute Rule A	XA	13
Execute Rule A to Tab	LT	13
Execute Rule B	XB	13
Execute Stored Vertical Space	XS	10
Execute String	ES	15
Halt	HT	17
Horizontal Space Absolute	HA	10
Horizontal Space Relative	HR	10
Horizontal Space in Scaled Spots	HS	10
Horizontal Space of 400 Units	HH	11
Horizontal Space of 200 Units	HQ	11
Horizontal Space of 100 Units	HE	11
Horizontal Space of 50 Units	HX	11

Table B-3. Functional Command Code Index (Continued)

Function	Mnemonic	Page
Horizontal Space of 25 Units	HT	11
Horizontal Space of 72 Points	SV	11
Horizontal Space of 36 Points	TS	11
Horizontal Space of 18 Points	EH	11
Horizontal Space of 9 Points	NE	11
Horizontal Space of 4-1/2 Points	FH	11
Letterspace Absolute	LA	11
Letterspace Relative	LR	11
Mark Horizontal Position	MH	12
Mark Location	ML	12
Mark Vertical Position	MV	11
Matrix in Data Stream	MX	15
No Operation	--	6
Normal Mode	NM	8
Oblique Mode	OM	8
Page Lead Immediate Vertical	PL	12
Position Horizontal Absolute	PH	12
Position Vertical Absolute	PV	12
Repeat Character	RC	14
Reserve String	RS	14
Reset	RI	18
Reset String Pointer	RP	15
Return Beam to Left Margin	RB	9
Return to Horizontal Mark	HM	12
Return to H-Location	RH	12
Return to Location	RL	12
Return to Vertical Mark	RM	12
Return to V-Location	RV	12
Set Horizontal Size	HZ	8
Set Left Margin	MA	9
Set MRU Frame Pulldown	PD	20
Set MRU Advance Image	MI	20

Table B-3. Functional Command Code Index (Continued)

Function	Mnemonic	Page
Set MRU Margin	MU	19
Set MRU Zoom Factor	ZF	19
Set Oblique Angle	OA	8
Set Point Size	PZ	7
Set Program Mode	PM	20
Set Retrace	RT	13
Set String Counter	SC	15
Set Tab	ST	9
Set Vertical Size	VZ	7
Shift In	SI	8
Shift Level	SL	8
Shift Out	SO	8
Skip Data	SB	18
Start Page	SP	16
Store Horizontal of Rule A	AH	13
Store Horizontal of Rule B	BH	13
Store Horizontal Space A	A#	11
Store Horizontal Space B	B#	11
Store Horizontal Space C	C#	11
Store Horizontal Space D	D#	11
Store Vertical of Rule A	AV	12
Store Vertical of Rule B	BV	13
Store Vertical Space	V#	10
Store Vertical Spots	SR	10
Tab	TB	9
Tab Carriage Return	TC	9
Unlock a Font	UF	7
Vertical Space Absolute	VA	10
Vertical Space in Scaled Spots	VS	10
Vertical Space in Spots	SD	10
Vertical Space Relative	VR	10

APPENDIX C

ON-LINE SPECIFICATIONS

APPENDIX C ON-LINE SPECIFICATIONS

GENERAL

This appendix describes the structure, data formats, and operational specifications of the on-line interface by which an external device (front-end computer) can be connected to an Autologic phototypesetter to allow data transfer directly from the front-end system. Autologic phototypesetters handle data from an external device under programmed I/O (PIO) the same as if the input data were coming from a high-speed paper tape reader under interrupt control.

In the front-end system, composition formatting commands and text are generated and output in batch mode (i.e., individual jobs) for the phototypesetter. Data is transmitted between the front-end system and the phototypesetter using the handshaking routine shown in Figure C-1. Maximum data transfer rate is 10,000 bytes per second.

If the output from the front-end system is in serial mode, an intercomputer interface which converts data

from serial to 8-bit parallel mode is required; otherwise, the job data is fed directly through a 25-pin panel connector to either the APS-5 peripheral controller or the APS- μ 5 utility board within their respective systems.

The interface cable must be either twisted pair or flat cable from the external device to the peripheral panel and shall not exceed 25 feet in length.

NOTE

A special line driver and receiver device may be connected in the line for data transmission up to 500 feet. (See specification 106468.)

Data Format. Autologic phototypesetters accept input from an on-line port (or paper tape reader) and write it into a buffer. This allows asynchronous processing of input while waiting for the typesetter/peripheral to complete an operation. Incoming pages of data, as shown in Figure C-2, should be separated by eight bytes of nulls in order to reduce the incidence of errors and permit error recovery.

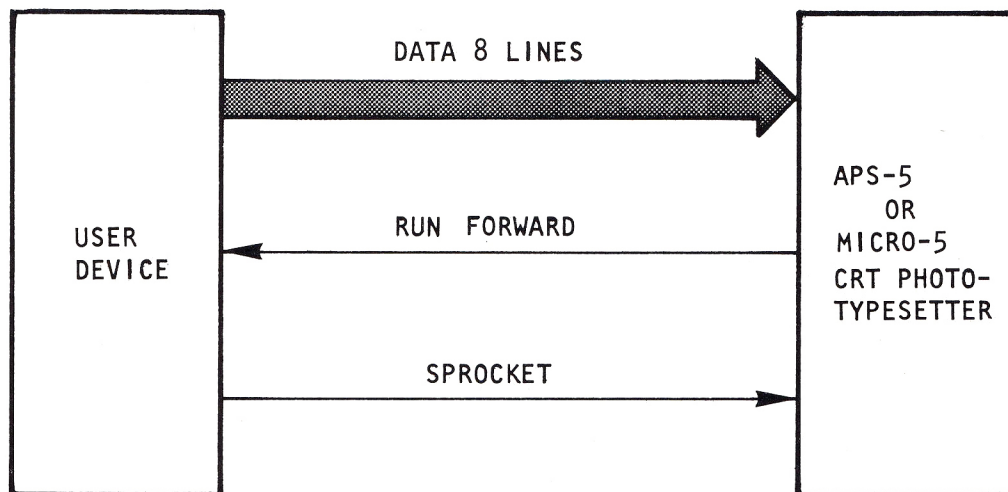


Figure C-1. On-Line Interface Handshaking Diagram

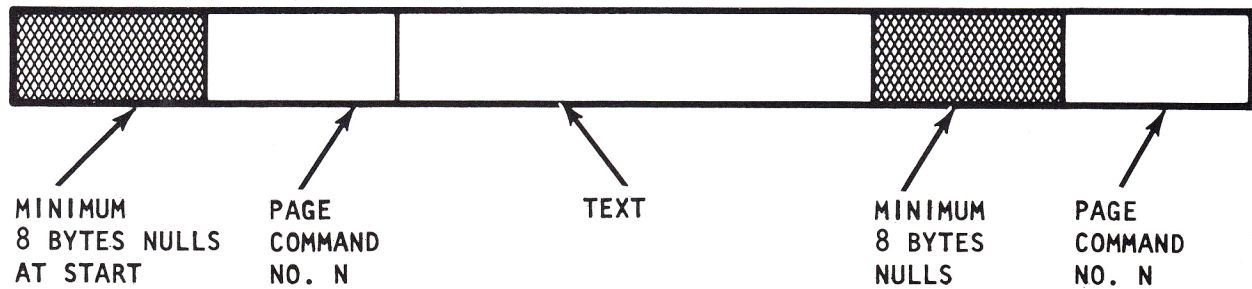


Figure C-2. Data Order Per Page

CONNECTION TO APS-5 ON-LINE INTERFACE

Logical Characteristics. The APS-5 on-line interface is a controller designed to operate a high-speed paper tape reader (see Figure C-3). Signals coming into panel connector PP06 are cabled to pins at connector P02 that terminate in the L1 or L11 peripheral controller (QC in earlier models) drawer.

A Run Forward signal is raised to request an 8-bit data byte. The on-line device or paper tape reader responds by first connecting the data byte to the data lines and then raising the sprocket line (see Figure C-4). The leading edge of the sprocket signal is used to strobe the

data byte into the typesetter. After the sprocket line is raised the Run Forward signal will fail or go false; the sprocket signal should last the specified duration then go false. When the Run Forward signal is again raised, the sequence is repeated.

The APS-5 can wait indefinitely for the sprocket signal, but it should not come sooner than one micro-second after the Run Forward signal is raised. The program will request the next data byte after the Run Forward signal goes false. The maximum time depends upon the operation currently being performed in the typesetter. In any case, the on-line device should wait for the Run Forward signal to go low and high again before sending a consecutive sprocket signal.

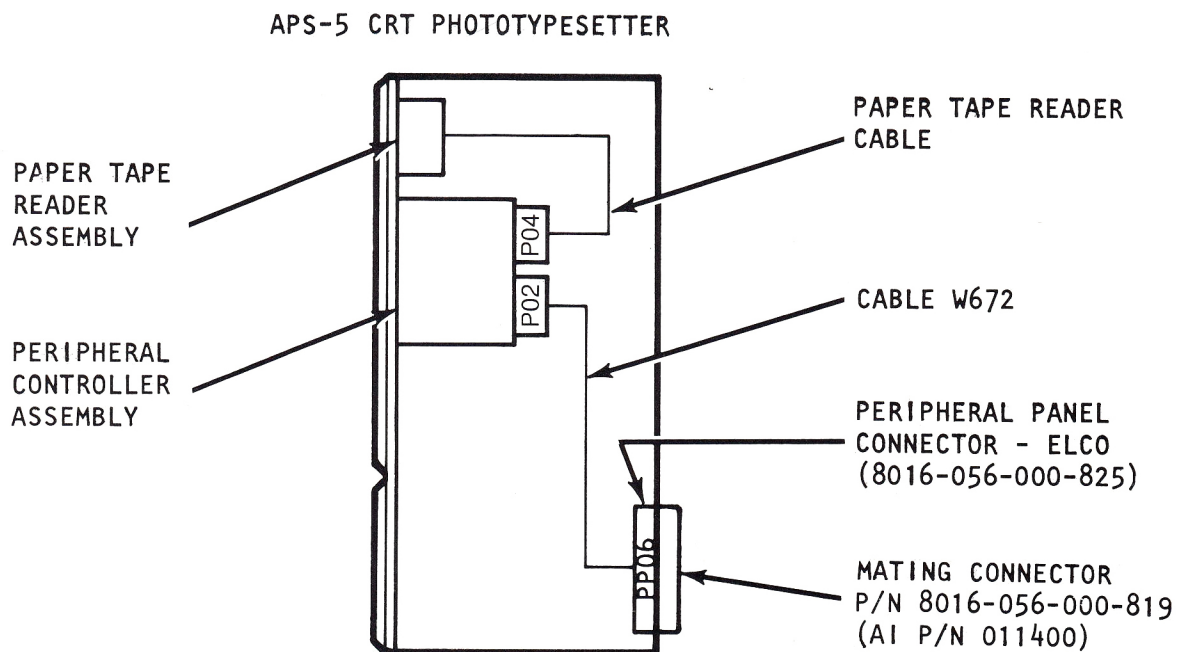


Figure C-3. APS-5 On-Line Interface Block Diagram

Table C-1. Electrical Interconnections for APS-5

Drawer Connector Pins at P02	Panel Connector Pins at PP06	Signals	PP06 Signal Pairs
1	1	ODDO	A } twisted pair
2	2	PTGD3	B }
3	3	ODD1	C } twisted pair
4	4	PTGD3	D }
5	5	ODD2	E } twisted pair
6	6	PTGD3	F }
7	7	ODD3	H } twisted pair
8	8	PTGD3	J }
9	9	ODD4	K } twisted pair
10	10	PTGD2	L }
11	11	ODD5	M } twisted pair
12	12	PTGD2	N }
13	13	ODD6	P } twisted pair
14	14	PTGD2	R }
15	15	ODD7	S } twisted pair
16	16	PTGD2	T }
17	17	ODSPKT	U } twisted pair
18	18	PTGD1	V }
19	19	N/A	Y } twisted pair
20	20	PTGD5	Z }
21	21	N/A	A* } twisted pair
22	22	PTGD4	B* }
24	24	PTGD5	X } twisted pair
25	25	ODRUNF	W }

APS-5 Electrical Characteristics. The Run Forward signal is generated by an SN7437 and sent directly out. The eight data signals and the sprocket signal are received and terminated in 330 ohms to +5v and 390 ohms to ground. All signals transmitted are high (+5v) for active (true). The data signals drive SN74298 registers. The sprocket signal drives the Schmitt trigger input of an SN74121 one-shot. All signals are transferred via twisted pair or flat cable (refer to Table C-1).

All lines must be twisted pairs or a flat cable must be used. In the APS-5, the connectors at PP06 must be the following:

Connector Type: Elco P/N 8016-056-000-825

A.I. P/N 011305

The user's mating connector that connects directly to PP06 must be:

Mating Connector: Elco P/N 8016-056-000-819

A.I. P/N 011400

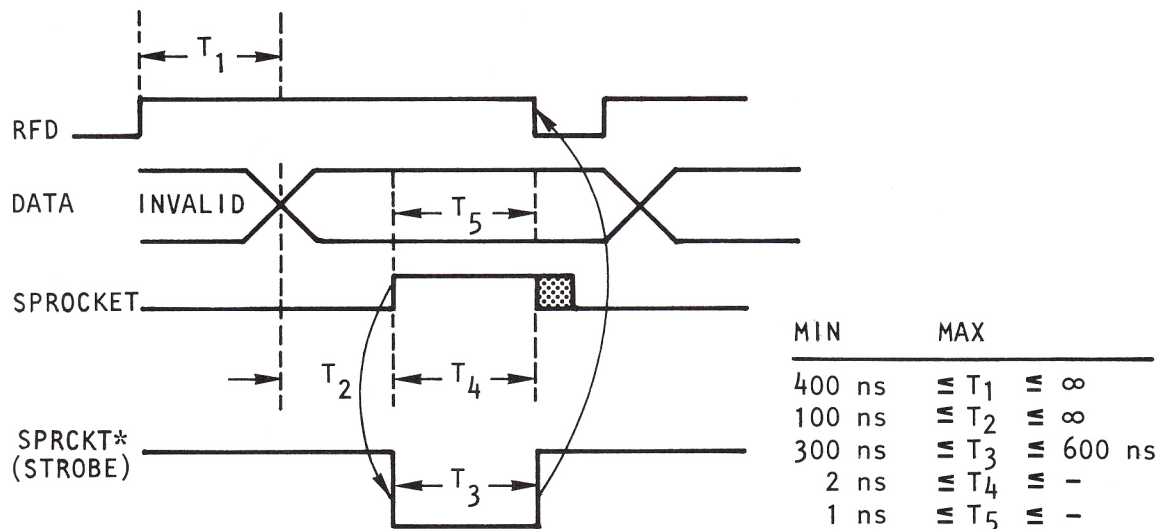


Figure C-4. On-Line Interface Timing Diagram

APS-MICRO 5 ON-LINE CONNECTION

The APS-Micro 5 on-line connection uses the same data formats and a handshaking routine to transfer data (see Figs. C-1 and C-2). On-line interface signal timings are presented in Fig. C-4. A block diagram of the interface is shown in Fig. C-5 where data flow is from left to right. Signals coming into panel connector J1 are cabled to pins at pin connector P5 into the utility board at J5.

Micro 5 Logical Characteristics. Data flow to the APS-Micro 5 via the parallel port is controlled by a hardware handshake using two signals, Run Forward (RFD) and Sprocket (SPROCKET). In the quiescent state, both RFD and SPROCKET are low. The APS- μ 5 indicates that it is ready for data transfer by raising RFD.

Data must be asserted at the APS- μ 5 end of the cable for a minimum of 100 ns prior to the assertion of SPROCKET at the user's end of the cable. SPROCKET signals that a valid data byte is available at the APS- μ 5. SPROCKET must be asserted for a minimum of 2 ns and a maximum equal to or less than RFD going false. SPRCKT* is generated by the SPROCKET signal and strobes the data into a data holding register approximately 0.5 μ sec after the SPROCKET signal is asserted.

Electrical Characteristics (Single-Ended I/O). The following signal levels are present for receiving and sending signals:

Receive (all signals except RFD)

Logical True Signal level: Min 2.4V, Max 5.0V
Logical False Min 0.0V, Max 0.8V

Send (RFD only)

Logical True Signal level: Min 2.4V, Max 5.0V
Logical False Min 0.0V, Max 0.4V

Electrical Characteristics (Differential I/O). The following signal levels are present for receiving and sending signals:

Receive (all signals except RFD)

Voltage Range + 15V
Differential Input 0.2V

If X and X* are a differential pair of input lines,
Assert Logical True is (X-X*) 0.2V
Assert Logical False is (X*-X) 0.2V

Send (RFD only)

Logical True Signal level: Min 2.4V, Max 5.0V
Logical False Min 0.0V, Max 0.4V

SN75113 and SN75115 are used as the driver/receiver circuit.

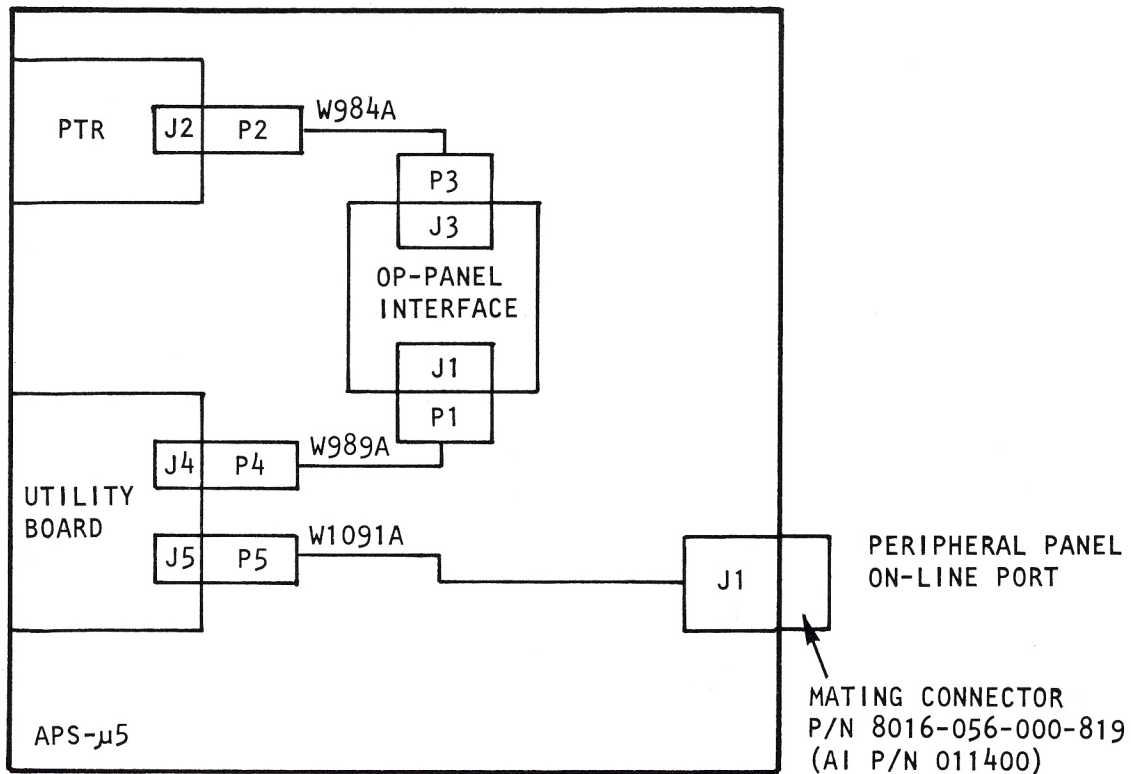


Figure C-5. APS-Micro 5 On-Line Interface Block Diagram

Jumper Configurations. Jumper configurations for both single-ended I/O signals and for differential I/O are as follows:

NOTE

Jumpers for Single-ended I/O are installed at the factory.

Single-Ended		Differential	
Short	Open	Short	Open
E1-E3	E1-E2	E1-E2	E1-E3
E4-E6	E4-E5	E4-E5	E4-E6
E7-E9	E7-E8	E7-E8	E7-E9
E10-E12	E10-E11	E10-E11	E10-E12
E13-E15	E13-E14	E13-E14	E13-E15
E16-E18	E16-E17	E16-E17	E16-E18
E19-E21	E19-E20	E19-E20	E19-E21
E22-E24	E22-E23	E22-E23	E22-E24
E25-E27	E25-E26	E25-E26	E25-E27
E29-E30	E28-E29	E28-E30	E29-E30

Table C-2. Electrical Interconnections for Micro 5

Panel Connector Pins at J1	Single Ended Signals	Differential Signals	Signal Pairs
1	D0	D0	A } twisted pair
2	GND	D0*	
3	D1	D1	C } twisted pair
4	GND	D1*	
5	D2	D2	E } twisted pair
6	GND	D2*	
7	D3	D3	H } twisted pair
8	GND	D3*	
9	D4	D4	K } twisted pair
10	GND	D4*	
11	D5	D5	M } twisted pair
12	GND	D5*	
13	D6	D6	P } twisted pair
14	GND	D6*	
15	D7	D7	S } twisted pair
16	GND	D7*	
17	SPKT	SPKT	U } twisted pair
18	GND	SPKT*	
19	N/A	N/A	} twisted pair
20	N/A	GND	
21	N/A	N/A	} twisted pair
22	N/A	GND	
23	RFD	RFD	W } twisted pair
24	GND	RFD*	
25	N/A	N/A	

All lines are to be twisted-wire pairs or a flat cable must be used. In the APS- μ 5, the connectors at J1 must be the following:

Connector Type: Elco P/N 8016-056-000-707

A.I. P/N 011303

The user's mating connector that connects directly to J1 must be:

Mating Connector: Elco P/N 8016-056-000-819

A.I. P/N 011400

Error Recovery. When an error is detected, the typesetter will stop processing and a message describing the nature of the error will be displayed. At this time operator intervention is required to continue processing. The operator can press either INITIAL or PROCEED.

If the operator chooses to press INITIAL, the typesetter will return to READY; it will then wait for another directive from the operator.

If the operator chooses to press PROCEED, the typesetter will take data from the buffer but will not process anything until three consecutive null characters are encountered. From that point, typesetting will continue as normal. It should be noted that the PROCEED option cannot be used for CHECK MEDIA and DISPLAY FAULT error conditions. Both of these errors require the typesetter be reinitialized to clear the error indication status.

Conditional and Unconditional Halts. It is often necessary to stop the typesetter at the end of a particular page and then continue typesetting without starting data transmission over. The HALT pushbutton and halt command (0375) are acted upon immediately and unconditionally suspend any further I/O operations. This unconditional halt is especially useful if, when using the paper tape reader, the tape has become tangled.



AUTOLOGIC, INCORPORATED

A subsidiary of Volt Information Sciences, Inc.

1050 Rancho Conejo Boulevard, Newbury Park, California 91320
(805) 498-9611 TWX: 910-336-1541 (213) 889-7400